40 lock

POPULAR Computing WEEKLY

35p 24 February-2 March 1983 Vol 2 No 8

This Week

Vic software

Mike Grace looks at a selection of Vic software including Vicgammon, Mind Twisters and Pixel Power. See page 12.

Acorn

David Kelly talks to Chris Curry of Acorn about the future of the BBC and Electron micros on page 11.

Dragon games

Keith and Steven Brain explain how to write your own games for the Dragon 32. First in a new series which starts on page 33.

BBC voltmeter

Peter Donn presents a short routine for using an analogue to digital converter as a voltmeter. See page 27.

★STAR GAME
Foxbat on ZX Spectrum by A Howes.
See page 8.

News Desk

Micro game makers warned

MAKERS of traditional board games are beginning to take action against companies producing computer versions of their games without permission.

Until now board games represented an ideal target for software houses. Conversion of a board game to a computer is comparatively straightforward and in many cases the name of the game is already established making the computer version easier to sell.

But with unauthorised versions of well-known board games proliferating a number of companies are trying to protect their trademarked games.

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Atari 400 price cut — again

IN A renewed bid to get sales of Atari home computers moving in the UK, the company has again revised its pricing.

The Atari 400 machine comes down another £30 to £159.99. With the Basic Programmer Kit at £39.95, this now puts the combined cost under the £200 barrier.

The price of the Atari 800 will stay at £399.95, but will be sold with an increased Ram capacity. The machine will have 48K Ram as standard rather than the 16K previously offered.

Both of these changes come into force on March 1.

Meanwhile, the American parent company, Warner Communications, has announced gloomy forth-quarter results. Income from Warner's Consumer Electronics Division — which includes Atari US — collapsed from $136.5m for the 1981 Christmas period to only $1.2m last year. This decline was due.

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Classified

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Continued on page 34

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The Team

Editor
Brendon Gore

News Editor
David Kelly [01-930 3271]

Sub-editor
Ninette Sharp

Editorial Assistant
Theresa Lacy

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Alastair Macintosh [01-930 3260]

Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street,
London WC2 7HF
Telephone: **01-839 6835**

Published by Sunshine Publications Ltd

Typesetting, origination and printing by Chesham Press, Chesham, Bucks

Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643

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Subscriptions
You can have *Popular Computing Weekly* sent to your home:
UK Addresses
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52 issues **£19.95**
Overseas Addresses
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52 issues **£37.40**

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All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

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Editorial

A number of parallels have been drawn between the music business and the burgeoning software industry.

Both records and software tapes have their own Top 10 charts. Packaging and marketing "hype" is playing an increasingly important role in both fields. Individual programmers, while they have yet to attain the status of rock stars, are becoming personalities in their own right.

The two industries have moved even closer together with the announcement that Virgin Records has set up a subsidiary, Virgin Games Ltd, to produce and market its own software in the UK. Virgin boss Richard Branson has already recruited Nick Alexander from Thorn/EMI to head up the new enterprise.

The prospect of computer software being sold through record shops is increasing, particularly in view of the decision by stores such as W H Smith, John Lewis and Laskys, to stock software for the popular micros.

It remains to be seen whether or not other music publishers will follow Virgin's lead. Certainly a number of traditional book publishers are looking closely at the software market.

In the words of a best-selling pop record of recent vintage "It ain't what you do, it's the way that you do it".

Next Thursday

Who will be first to complete *The Hobbit*? Find out next week as we start a new competition for all *Hobbit* players.

Also next week, the start of a new series devoted to Adventure players — Tony Bridge's Adventure Corner. Other features next week include *Romeo and Juliet*, a mathematical adventure game for the 16K ZX81.

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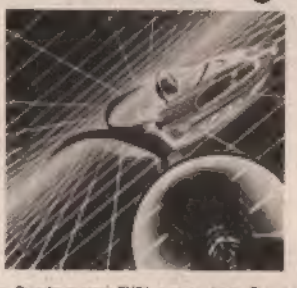

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Please state machine type.....

Trademark warning

Continued from page 1, col 3

TSR Hobbies has recently taken a full-page advertisement in a monthly magazine warning against producing unlicenced versions of its game *Dungeons and Dragons*. The announcement was intended as "formal notification to anyone using or intending to use any or all of TSR's trademarks that action will be taken against anyone who infringes these marks."

Dungeons and Dragons is registered world-wide as a trademark and only one company — Mattel — holds a licence to produce video games using the name.

TSR General Manager Tom Kirby explained "We have had sufficient troubles now to justify placing the advertisement — but so far most of the actions we have had to take have arisen as a result of ignorance by the infringing party. It has always been a question of drawing people's attention to the fact that *Dungeons and Dragons* is a trademark.

"We are hoping that the advert will serve to explain our position and prevent us from having to take any legal action in the future" he added. Such a public announcement creating awareness of the TSR trademark could also make any future legal action by TSR easier.

Waddingtons also is becoming concerned about the use of its names without permission. Managing director Andrew Lauder has no plans to licence any Waddington games and is on record as saying that he considers video games to be 'anti-social'.

Various computer versions of its board game Monopoly have appeared but in each case Waddingtons has discouraged the participants from using the word "Monopoly".

"We do not mind people having fun adapting our games for use on their home computer" said Lauder "but anyone wanting to base video games on any of our products for commercial purposes should be warned that the games and names are protected by copyright and trademark registration".

A problem is that even successful trademark actions have only resulted in a marginal change in the title of the computer game. To make matters worse, in the US a Californian appeals court has ruled that the name "Monopoly" had become too commonplace to be protected under trademark law. The Supreme Court is currently deciding whether to overthrow that ruling.

Atari.

Continued from page 1, col 4

according to Chairman Steven Ross, to substantially lower profits from video games cartridges and losses from its coin-operated games operation. He explained that Atari was experiencing "an intensity of competition never before encountered.

"In a business where hits have become very important, Atari's new cartridge releases were disappointing relative to expectations," he said.

Added to Atari's difficulties, the US announcement of the new top-of-the-range computer, the 1200XL, has received mixed responses. Critics of the machine claim that the 1200XL does not represent a significant advance over the present 800 system.

Dot-matrix printer from Epson

EPSON has expanded its range of printers with a low-cost dot-matrix model – the RX80.

Capable of printing at 100 characters per second, the tractor-fed bi-directional printer has 8K Rom on-board and can handle two full Ascii type sets. Six printing sizes are possible. It is fitted with a Centronics interface as standard and an IEEE or RS232 interface will be available as an option. A friction-fed version of the machine is also planned – the RX-80FT.

Although no price has been fixed yet, Epson's Bob Stead expects the RX-80 to sell for around £300.

NEC launches home computer in US

NEC has announced a new home computer in the US — the PC-6000 which will sell over there for around £350.

Alan West, NEC's UK marketing manager said: "We are actively looking at it — there is every possibility we will launch it in Britain this year."

The PC-6000, based on NEC's own PD780C-1 Z80 compatible chip, has a full-size keyboard, 16K Rom (expandible to 32K), 16K Ram (expandible to 32K), and runs the N60 version of Microsoft Basic. It has nine colours, and four sound channels — three music, one noise. The sound function has an eight-octave range with variable volume, it is possible to play chords, and there are a number of predefined sound effects.

The PC-6000 is fitted with cassette interface, Centronics printer interface, two general purpose parallel ports — for joysticks or a digitiser unit — tv output, composite video output, loudspeaker output and an external bus for Rom or Ram expansion.

Mini-floppy disc drives, RS232 communications interface and 2K, 4K and 8K expansion options are available. So far in the US there are more than 50 Rom-based games cartridges on sale for the machine.

"We see the PC-6000 at the Atari rather than the Spectrum end of the market — if it goes on sale in the UK it will have a price around £400," explained Alan West.

Nick Alexander and Richard Branson, of Virgin.

Virgin empire moves to take in home computers

THE VIRGIN Group of Companies is expanding its record, film and book empire into the video games market.

A new subsidiary company has been set up — Virgin Games — to develop games software for the Atari, BBC, Vic20 and Commodore 64, Dragon, Oric 1, Sinclair Spectrum and TI 99/4A machines.

"In software programming, as with the record business, the UK has more talent than anywhere else — and we will set up an operation to tap that talent," said Virgin Chairman Richard Branson. "In so doing we intend to take on the American market at its own game."

Nick Alexander has been recruited to organise the new company. Having been marketing manager of HMV Record Stores, Alexander went on to mastermind the launch last year of Thorn EMI's range of home computer software.

"We will bring new, aggressive, professional marketing and merchandising techniques to an industry that has yet to use them in its growth from the mail-order columns and into the high street," he commented.

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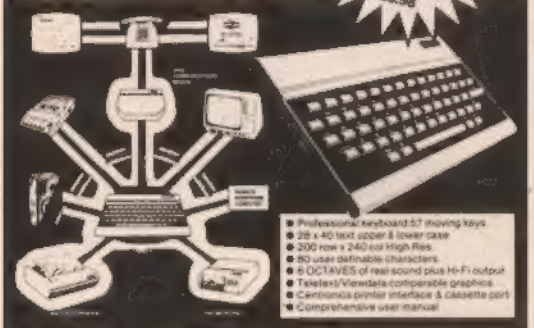

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Adventure 1: Based on the original game by Crowther, this game was the start of the Adventure craze. Reviewed Sinclair User Iss.2. Features save game routine as the game can literally take months to complete. 16K ZX81 and 48K Spectrum. — ZX81 8.95 — 9.95

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Communicating telepathically

I buy your magazine regularly and find it excellent value for money. However, I own a BBC and my school will shortly be buying its own BBC.

I wonder why the BBC computer seems to be the poor relation in comparison with the others. As Spectrum and Dragon have their own page, why not the BBC. My Local Education Authority only recommends the BBC, not the others.

So come on *Popular Computing Weekly*, lets have more for the Beeb.

R A Smith
Headmaster
Blue Bell Junior School
Gordon Road
Nottingham NG3 2LE

You will be glad that we have just started a special page for the BBC computer. The main emphasis will be on the use of the BBC in schools — so we are hoping that all of you BBC owners will start sending in some programs which you have developed in or for school or which are in some way relevant to the use of the BBC computer in education. Start writing.

Dragooned into glory

Other Dragon tamers may be interested to learn that there is a set of 32 inverse (green on black) characters which do not seem to be accessible from the keyboard either with *Shift O* or via *Chr$*. These are the inverse numerals and most of the symbols, which could be useful when designing headings for titles.

The characters are ASCII 32 to 63, and the Dragon *Chr$* function interprets them as non-inverted. They can, however, be *Poked* to the screen memory positions 1024-1535 (which correspond to print positions 0-511), quite easily.

The following short program will reveal them in all their glory.

```
10 FOR N = 1 TO 16: PRINT: NEXT
20 FOR N = 0 TO 255
30 PRINT CHR$(N);
40 NEXT
50 FOR N = 0 TO 255
60 POKE 1024+N,N
70 NEXT
80 GOTO 80
```

(Line 10 is merely to ensure that the cursor is at the bottom of the screen.)

Incidentally, for those interested in the graphics capabilities of the beast, much useful information is to be found in *Color Computer Graphics* by William Barden Jr, published by Tandy.

J I Robertson
8 Russell Way
Wootton
Bedford

Clocking up on Hungry Horace

I was very interested to read the letter from David Pountney concerning *Hungry Horace*. I, and my two children, also quickly became addicted to the game. However, my 9½-year-old daughter, after less than two weeks, discovered the flaw in the game, and so far has a very blasé score of over 97,650 or thereabouts; it changes from day to day! My son has also "clocked" over 70,000, whilst I, needless to say, am still "nail-biting" my way to 3,000!

Despite the "head" start they now have, my children are still playing the game, but are now more interested in how many "Parkys" they can dodge in any one section of the park.

Derek Brennan
Haibre
40 Stonebridge Way
St Anne's Park
Faversham
Kent

Disservice of bad manuals

Just to add a little more weight to the many thanks that you have already received for the page devoted to the Dragon. With the features this machine has to offer, at the price, it has to become a very popular computer.

My only complaint is with the pathetic manual supplied with the Dragon. Many of the examples will not run because of errors.

Manufacturers just do not seem to understand the importance of the manual. People of all ages are getting interested in computers. In many cases, the quality of the manual will decide the computer they buy.

I firmly believe that hundreds of people will buy these machines and be quite unable to use them. With a lot of patience it is possible to sort things out to a certain extent, but it takes a lot of headbeating and trauma.

The *ZX81 Learning Lab* is a treasure and makes the supplied manual appear incomprehensible by comparison. The book is not much bigger than the manual, but it is written in a manner that seems to want to make things clear, instead of turning a simple explanation into a puzzle.

Let's hope your magazine gets bigger. Put up the price if you will, but let's have more.

W Slater
44 Hope Street
Brampton
Chesterfield
Derbyshire S40 1DG

There is a happy land

I am a regular subscriber to your magazine. Although I find it very good I am fed up with opening the pages and finding nothing but ZX81, Spectrum and Vic20 programs. Surely the market is already flooded with programs for these machines so how about some for the poor old Dragon 32.

S Rea
18 Bursledon Close
Felpham
Bognor Regis
W Sussex PO22 8HP

Owners of all of the popular home computers regularly write to us and complain that we only seem to publish programs for all the popular home computers, except theirs. The grass is always greener . . .

Roll up and have a shot

You have done it, you have actually published a program for the Atari 800 (*Popular Computing Weekly*, Vol 2 No 4). I have every magazine of yours right from day one, as I used to have a Vic20.

Since I have now changed my computer to an Atari 800, I was pondering on the thought of cancelling my copies of *Popular Computing Weekly* (what a crime) — until a few issues back you promised to start printing Atari programs. I now intend on keeping my order of one of the best mags out for computer addicts like myself. Keep up the good work.

PS Congratulations to G C Roberts for the Maze program. It was very good and uses the Atari sound and graphics capabilities very well.

N Scott
110 Coventry Road
Bulkington
Nr Nuneaton

I am glad you liked the program. Unfortunately, we are still being sent very few Atari programs. So come on all you Atari owners, don't be shy. If you have a program that you think is worthy of publication, send it in.

Sense on royalties

On following the debate on the "Software Houses vs Software Libraries", the answer seems amazingly clear. Just come to some agreement on reasonable royalties.

It is more than obvious that libraries are so popular because renting is cheaper than buying. Also, in consequence of this, the libraries need to be bulk buyers of programs and so are a market to be considered.

Do not forget either that not everyone is rolling in money. Where someone may have the money to rent a tape does not automatically mean he will have the money to buy it instead.

Finally, experience has taught me that if a fairly expensive program is concerned, it pays to borrow it for a short time to test it. This is better than risking say £5 on something that may prove totally useless to you.

PS Let's find a compromise now, before everyone begins to suffer.

David Ward
45 Hibernia Point
Wolvercott Road
London

Coming to an agreement on royalties is easier said than done. However, we hope that we have provided a lead by refusing to accept advertisements from software libraries that hire out tapes without the publishers' permission.

Foxbat

A new game for Spectrum by A Howes

Foxbat is a fast moving graphics game for the 48K Spectrum. The object of the game is to fly your plane as low as possible over the mountainous terrain which rolls across the screen. The lower you fly, the more points you accumulate — but watch out for trees and steeply rising cliffs. My high score is 2828, but I am sure it is possible to do better.

The mountains are moved across the screen by machine code. The height of the mountains is controlled by the data stored in lines 1000-2000. The user defined graphics for the planes and trees are contained in lines 2010-2020.

The *in* statement has been used instead of *Inkey$* as this allows two keys to be read at the same time.

The control keys are Z (left), X (right), P (up) and L (down).

First enter the main program, then type:

```
Save "Firefox" Line 1
New
```

Next, type in program two and Run it. The machine code should then be entered byte by byte. This should be saved directly after the main program, which will load it automatically. ■

```
  1 PAPER 0: INK 7: CLS : BORDE
R 5
  2 CLEAR 65099: LET ss=0: LOAD
 ""CODE 65100
  3 GO TO 2000
  4 LET s=0
  5 LET fy=0: LET fx=0
  6 LET b=0: LET by=0: LET bx=0
 10 FOR n=16 TO 21: PRINT AT n,
0; PAPER 5; INK 5;"
                    ": NEXT n
 20 LET f=0: LET x=10: LET y=7
 30 PRINT AT 21,11; INK 0; PAPE
R 5;"FIREFOX";AT 19,11;"SCORE ";
s;AT 17,11;"HI SCORE ";ss
 100 FOR z=1 TO 209
 120 READ n
 130 POKE 65190,n
 135 LET s=s+y
 136 PRINT PAPER 5; INK 1;AT 19,
17;s
 140 LET l=USR 65100
 150 LET y=y+(IN 49150=253)-(IN
57342=254)
 155 LET x=x+(IN 65278=251)-(IN
65278=253)
 157 IF x<0 THEN LET x=0
 158 IF y<0 THEN LET y=0
 159 IF ATTR (y,x)<>7 OR ATTR (y
,x+1)<>7 THEN LET k=1: FOR n=1 T
O 20: LET k=-k: BEEP .15,n*k: NE
XT n: GO TO 3000
 170 PRINT AT y,x; INK 7; BRIGHT
 1;"➘"
 172 IF n=7 THEN PRINT INK 4;AT
16-n,31;"▲"
 173 FOR d=1 TO 2: NEXT d
 174 PRINT AT y,x;" "
 175 NEXT z
 180 PRINT AT 18,8;"MISSION COMP
LETE": GO TO 3000
 310 RESTORE : GO TO 100
1000 DATA 1,1,1,1,1,1,1,1,1,1,1,
1,1,1,1,1,2,3,4,5,6,7,8,9,
10,11,12,13,14,13,12,11,10,9,9,9
,9,9,9,9,9
1010 DATA 9,9,9,9,9,9,9,9,10,10,
11,11,10,9,8,7,6,5,3,2,2,3,4,3,1
,2,3,4,5,6,7,8
1020 DATA 7,6,5,4,3,2,1,1,1,1,1,
1,2,2,2,2,3,4,4,3,3,3,3,3,4,4,
5,5,5,5,5,5,5,5,5,5,5,6,4,6,
8,6,6,6,7,7,7,7,7
1030 DATA 9,9,9,9,9,9,9,10,11,12
,13,14,15,15,15,15,14,14,13,13,1
2,12,11,11,11,11,9,7,5,3,4,5,6,7
1040 DATA 9,11,13,15,15,16,16,16
,14,14,14,14,14,14,14,16,16,16,1
4,12,11,9,7,5,3,1,1,3,3,5,6,8,9,
11
1050 DATA 8,6,4,2,2,1,1,1,1,1,1,
1,1,3,9,12,14,16,16,16,16,16,15,
15,15,15,15,15,15,15,15,15,15,15
,15,15,15,15,15,14,13,12,10,9,8,
7,6,5,4,3,3,2,1,1,1,1,3,3,4,2,
2,1
1070 DATA 1,1,1,1,1,1,1,1,1,1,1,
1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
1,1,1
2000 RESTORE 2000
2010 DATA BIN 00001000,BIN 00001
000,BIN 00111100,BIN 00111110,BI
N 00111110,BIN 01111111,BIN 0110
1011,BIN 00001000: FOR n=0 TO 7:
 READ r: POKE USR "▲"+n,r: NEXT
n
2015 DATA BIN 0,BIN 00000,BIN 11
110000,BIN 11111000,BIN 11111111
,BIN 00011111,BIN 00000111,BIN 0
0001111: FOR n=0 TO 7: READ r: P
OKE USR "➘"+n,r: NEXT n
2016 DATA BIN 0,BIN 0000,BIN 00,
BIN 0,BIN 11110000,BIN 11111100,
BIN 11111111,BIN 0000: FOR n=0 T
O 7: READ r: POKE USR "➘"+n,r: N
EXT n
2020 RESTORE
2025 CLS
2030 PRINT AT 5,12;"FIREFOX";AT
21,0;"© A.Howes"
2040 INPUT "Start ?";s$
2050 GO TO 4
3000 RESTORE : INPUT ("You score
d ";s;" Another game ?");s$
3010 IF s>ss THEN LET ss=s
3015 CLS
3020 PRINT AT 17,20;ss
3050 IF s$(1)="n" THEN STOP
3060 GO TO 4
```

MACHINE CODE:

17	0	88	1	255	1
50	1	88	237	178	1
32	16	33	255	63	17
254	63	237	176	22	128
62	0	33	31	64	1
32	0	54	0	0	9
21	186	40	2	24	246
62	7	50	31	88	50
63	88	50	95	88	50
127	88	50	159	88	50
191	88	50	223	88	50
255	88	50	31	89	50
63	89	50	95	89	50
127	89	50	159	89	50
191	89	50	223	89	22
1	62	0	33	31	90
1	32	0	54	45	0
198	0	237	66	21	186
40	2	24	243	201	0

(The second byte is 0 !!!)

program 2:

```
  10 CLEAR 65099
  20 LET a=65100
  30 FOR n=1 TO 114
  40 INPUT b
  50 POKE a,b
  60 LET a=a+1
  70 NEXT n
  80 INPUT "Are you ready to sav
e machine   code ,after FIREFOX
(y)";s$
  90 IF s$="" THEN GO TO 80
 100 SAVE "hang on.."CODE 65100,
120
```

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Waiting for Electron

***David Kelly** talks to Chris Curry of Acorn about the BBC and Electron micros.*

With Acorn poised to launch its BBC micro in the US (*Popular Computing Weekly*, November 4), and with orders still flowing in the UK, the future looks bright for managing director Chris Curry.

One of the most encouraging things for Curry has been the take-up figures for the BBC machine in the Department of Industry's Micros in Primaries Scheme — almost 80 percent.

"Whatever the reasons, I think that there is every chance that the BBC machine will become the standard in schools.

"The number of machines being bought by individuals for use in the home has surprised us. We never expected the BBC machine to compete with the Spectrum first time round, but people who want something better than the Spectrum are turning to the BBC."

When Acorn's new micro, the Electron, makes its debut at the end of March, it will coincide with major product launches for the BBC machine. "There is an awful lot of stuff coming out at the same time — that's not the way we originally planned it, but there you are," smiles Curry wryly.

"As the Electron comes in at the low-cost end of the market, so the BBC will move up with a range of business software and second processors.

"When we launch the Z80 processor in April, it will be fully supported by a range of CP/M Z80 Basic business software from Acornsoft.

"For the 16032 processor, one of the systems we are working on will be a network-type system giving a number of machines time-shared access to the 16032.

Chris Curry, Acorn's Managing Director.

"We are also very interested in the microcomputer/video disc combination. There are a lot of companies waiting in the wings to do material for it.

"A rudimentary system was on display at the BBC's World Trade Centre Show, but the finished product will be capable of much more than that. The problem at the moment is that the bit drop-out rate is quite high for video discs. Techniques will have to be improved dramatically before such a disc can be used for data-base storage."

With the UK side of BBC sales sorted out now — and the embarrassing order backlog cleared — Acorn has been looking around for other markets. For several months now BBC machines manufactured in Hong Kong have been on sale in Australia and South Africa. Acorn has also opened a branch office in Germany which will distribute the micros to most of Europe.

By late April, the NTSC (US colour tv system) version should be on sale in America. "In the US the price-war between Texas Instruments and Atari is vicious but, surprisingly, we find we are not price sensitive. The only machine which comes close to offering the same sort of performance in the US is the Commodore 64.

"We will be selling the all-singing, all-dancing, model B for around $800 (about £520), and we have just spent $1¼m putting the BBC Computer Programme on Public Broadcast Service tv over there."

Right now Acorn is very keen to hear from any company making any sort of material — hardware or software — for the BBC machine: "We will promote it over there at the same time as the computer," says Curry.

The Electron is, as far as the software is concerned, almost identical to the BBC machine: both use the same version of BBC Basic and any programs written in Basic for the BBC will run on the Electron. Tapes, however, will not run directly because of differing input/output systems. The only thing missing on the Electron is Mode 7 — the Teletext mode. All the other display formats are possible, including the highest resolution mode.

Hardware for the Electron is completely different. "It has only cassette, tv and RGB monitor interfaces, together with an expansion bus. If you want to connect anything else you will have to buy from a range of add-ons: modules to connect discs (it uses the same disc interface as the BBC), RS232 and IEEE interfaces, Econet connector and a light-pen module.

"The real intention of the Electron is to provide a low starting point — the standard 32K model will cost £150 excluding VAT. There is no compromise on quality either — the keyboard, for example, is the same as the one on the BBC."

The Electron will be manufactured in Singapore. "One reason is that the duty on components in the UK is thoroughly unacceptable — notwithstanding the fact that overseas suppliers have to a certain extent adjusted their prices to take account of it.

"But the main reason we will be manufacturing the Electron overseas is that we wanted to apply some fairly radical production techniques. We find there is less resistance to change in countries like Hong Kong and Singapore — they go straight in with capital expenditure on new equipment — automated component insertion tools, bonding equipment and the like. British companies find this difficult to do and there wasn't anyone in the UK who was already set up for it. We would obviously prefer to be manufacturing in the UK, but the first run, at least, will be in Singapore.

"We will not do any advertising until we are *completely* confident that stocks are available. More than almost anybody else we have suffered in the past from problems of lack of product when the demand is high. And we are not going to let it happen again".

With the Electron, Acorn has chosen what is becoming the most competitive sector of the market — one in which new machines seem to be launched almost every week.

"Computer brands will appear and disappear in the coming months — it would be wise to go for a company that is here to stay," offers Curry confidently. ■

Mind twisters and more

***Mike Grace** turns home doctor in an attempt to find out what the Vic20 can actually do.*

One of the main advantages of a computer (so the sales blurb tells you before you buy the thing), is the tremendous versatility of the machine. It seems that there is almost no end to the possibilities, and people who are 'into' computers (excuse the phrase) are forever extolling the fact that there are really no limits to their capabilities. But, having bought one and played around with it for a little while, it's surprising how difficult it is to explain to a relative or friend just what it *can* do. "Yes dear, it's all very nice," says a favourite aunt, "but what does it *do*?"

This latest batch of software I received for the Vic goes some way towards answering that question, because it is a blend of assorted software — a pot-pourri of possible applications for a home computer.

Let's start with the simplest application — games. I know games are old hat to many people, but they probably form the mainstay of home computing software. Many of them really are fun, and some of them help beginners to learn how to program.

The first tape is a compilation tape from Impact Software containing four programs. Compilation tapes usually spell 'danger' to me, because I suspect that none of the games will be of a high standard, but I was proved wrong on this one. The first game on one side — *Alien* — was indeed rubbish, but the second game — *Roadrace* — proved to be surprisingly simple in concept yet extremely addictive. *Alien* is yet another poor man's *Invaders* with nil graphics and very slow action, but might well appeal to 3-5 year olds.

Roadrace is a mix of *Pacman* and a maze program with simple yet effective graphics (and can be used with either a joystick or keyboard). A simple maze appears and the letter *H* (your enemy) moves along it, leaving behind little dots in its wake and changing course at random. Your task is to pick a course in the maze that allows you to eat up the dots (as in *Pacman*), but avoiding the *H* in your travels as it will obliterate you. This is not as easy as it sounds as *H* can suddenly switch lanes on you and once you are in the maze you cannot reverse.

The game sounds too simple to be fun and the first few times I played it I almost gave up, but as I began to pick up the game so I picked up interest. After an hour I was as keen as before and still trying in vain to beat an earlier score.

On the other side of the tape are two more games. Again one I found not much value but the other — *Pontoon* — is the traditional card game and I found it completely addictive. The computer is the bank and deals out cards at random (one of the advantages of Vic graphics here is the use of the traditional playing card symbols to add authenticity). You have 100 chips to start with — careful playing plus a touch of luck can make this game last a long time.

The next tape is another compilation for the unexpanded Vic, from Romik Software, but this time it is a real gem. All four programs are very good indeed, perhaps because they are, based on traditional games. The games are *Blackjack* (similar to pontoon but with better graphics), *Decipher* which is really Mastermind, *Four Thought* which is a computer version of *Four-in-a-row* where you have to beat the machine to get your four colours in a horizontal, vertical or diagonal row, and *Teaser*. The last game is the weakest of the bunch, but requires a lot of skill and 'thought' as you try to beat the Vic in selecting three numbers to total 15.

In all four games a lot of care and thought has gone into presentation — the instructions appear and disappear, while colours and flashing screen borders add to the interest. The quartet has a professional feel it sorely lacking in many other examples, and at virtually £10 I reckon it is excellent value.

Speaking of value, I had the feel as I was reviewing this collection of tapes that computer versions of traditional games (chess, backgammon, pontoon, Mastermind, etc) are perhaps better than the arcade games. This is because most games already have a history of being 'playable' and the novelty of the pure video game does wear a little thin after a while. Besides that there is the element of trying to beat the machine, made all the more enjoyable when you win. Perhaps it's because I feel the machine is superior to me in assessing moves, estimating gambles, etc. So, when I win I feel I have really beaten a superior being, while at the same time no-one has had to lose (no-one human, that is). Food for thought!

Continuing with the games theme, I tried *Vicgammon*, the Bugbyte version of *Backgammon* which is for the expanded Vic, (3K or more). Luckily I already knew how to play as no instructions were given. But, apart from this, I found the game very enjoyable and the graphics well suited to the game. My only criticism is that when coming off the bar I had no choice as to which die I picked (the computer would only let me use the top die), but apart from this the game was very true to reality (and I almost won as well!). This is the best game from Bugbyte I have tried, and well worth the £7.00 price which includes post and packing.

Finally, in the games section are two extremely good and highly annoying games from Pixel, *Harvester* and *Brainstorm* at £7.95 for the pair. *Harvester* is a board game for two players. Each may draw straight lines on a board in an attempt to trap the other player who cannot cross the line. My explanation is poor because I cannot put this game easily into words, but it is a good game and reasonably original.

Brainstorm is the better of the two in that I cannot do it (Lord knows I've tried), and involves a kind of teaser game relying on thought alone. Basically there are three humans and three aliens on one side of a river. All six need to get to the other side,

Firm	Program	Cost	Value (1-10)
Bug-Byte 100 The Albany Old Hall Street Liverpool L3 9EP	*Vicgammon*	£7.00	8
Romik 24 Church Street Slough SL1 1PT	*Multisound Synthesizer* *Mind Twisters*	£9.99 £9.99	9 8
Eastmead Computer Systems Ltd Eastmead House Lyon Way Camberley Surrey GU16 5E2	*Basic Medicine* *How Healthy Are You*	£6.75 £6.75	3 3
Impact Software 70 Redford Avenue Edinburgh EH13 0BW	*Games Pack*	£5.00	5
Pixel Productions 92 Northam Road Southampton SO2 0PB	*Harvester and Brainstorm* *Pixel Power*	£7.95 £7.95	7 10

but the boat will only carry two at a time. The snag is that if two aliens are ever on one bank with only one human (or three aliens with two humans), then the telepathic waves from the aliens give the humans a brainstorm and the game is over. Well, you can guess the sort of thing! After many hours, I still have not worked it out.

I started this review by talking about some of the other applications of the microcomputer, so let's move to a different type of program. Eastmead Computer Systems recently introduced a range of medical topics under the title "*The Home Doctor Series*". These programs are designed to help the general public educate themselves on such matters as *Basic Medicine, How Healthy Are You* (the two I had to review) and other topics such as *101 Nursing Tips, All About Children, Mainly for Men* and *Mainly for Women*.

Eastmead Systems make the point that the programs in no way replace the professional medical specialist, but complement them by giving people a better idea of how to cope with medical matters themselves. This is indeed a laudable project, as ignorance often breeds worry and fear. The only problem with this type of information is that a little knowledge can be a dangerous thing. But, the program sensibly covers that point by running through a series of basic questions (such as have you noticed any lumps or swellings grow in size or start bleeding — do you take any home medicines regularly, etc) and advising the person to take medical advice if the answer ■ any of these is *yes*.

Does the idea work? Well, for *Basic Medicine* the answer is definitely no — not because of any basic fault in the factual content or the presentation, but because of the medium. I find ■ hard to justify the use of a microcomputer to either give simple basic advice on the best way to cope with scalds or burns (a book would be better), and the sections on what to do in the case of an accident, while being good fun for a first aid revision, are hardly the way to deal with ■ real emergency. I have this picture of Mum rushing to the Vic after her baby has fallen from the tree, to sit waiting for the cassette to *Load* (quite a long time as this program needs 8K) and then being asked if he has bleeding that won't stop. Upon answering *yes*, she is advised ■ take him to hospital. It just doesn't seem to me to be the right way of passing on that sort of information, however accurate and however important.

The other problem with this type of program is that, to ensure it is not misused, the programmer (or his medical adviser) must be cautious and err on the side of safety. This leads, for example, in the section on headaches to possible diagnoses of high blood pressure, eyestrain, sinusitis, glaucoma, etc, which could all cause some distress ■ the uninitiated person with a case of tension headache. Now I know it is best that the patient seeks his doctor, but as most people are not capable of self-diagnosis I suspect this type of sound advice could ■ misinterpreted.

This is, I suspect, one of the main problems with computer software. Can there really be an advantage in presenting chunks of basic information on a screen? After all, the rapid decline of paper that is still being predicted seems to be as far away as ever (you are, let's face it, reading a magazine at the moment). And when you get down to hard facts, this program at £6.75 gives very poor value for money as compared with a popular medical book at the same price.

At first, I thought the second program from Eastmead Systems might have been better suited to the medium of the micro — but alas no. The concept of health care in multiple choice should have lent itself better to micros — but when I began to view the programs on smoking, dieting, exercise, coping with stress, and the other valuable topics, again I was faced with very few facts (correct but lacking ■ style, imagination and depth) and it was easily possible to 'beat the system'. For example, on answering the section on smoking (I do not smoke by the way) I truthfully keyed in all the correct answers to all the questions and was faced with exactly the same response as if I had been a smoker — ie the program advised me I was smoking too much and needed to cut down. Now while this information is good common sense — the fact that I was able to get this response when I answered as if I did *not* smoke to me invalidates the whole program.

While I do know something about medicine and computers, one of my greatest regrets is not being able to play a musical instrument, so it was with a mixture of anticipation and hope that I approached the *Vic Multisound Synthesizer* for the unexpanded Vic from Romik Software. This is an extremely versatile piece of software, on cassette, which allows me to convert my Vic into a composer's aid.

Upon *Loading*, the screen flashes with colour and sound and I have the choice of four modes (selected by pressing the F1-F7 function keys) which allow me to compose music, retain it in memory to be replayed at the touch of a key, or saved on tape, and with the option of a background drumbeat. There are numerous extra functions which include items such as decay, increase or decrease the rhythm, raise or lower octaves, and still other things that I have yet to discover. As my knowledge of musical terms is zero, I have not yet been able to extract the full versatility of this cassette, but it ■ really fun learning.

Compared with the Medical tapes I reviewed earlier, this cassette at £10.00 seems an incredible bargain.

The final tape for review is another from Pixel Productions which, like the *Multisound Synthesizer*, expands the capabilities of the Vic (and the imagination of the user) considerably. Called *Pixel Power*, it is a method of allowing the character set to be changed with amazing simplicity. I have often looked ■ programs in magazines which purport to let me generate my own characters, and after a lot of head-scratching and mind-blowing I have elected to "leave it for another day" as I cannot quite seem to be able to work out what it's all about. Anyone else like that will find this cassette a boon — and also will find out how much more fun computers can be. Again this is a real example of the

versatility of the micro as it allows (with enough time and patience) you to paint pictures, write in Greek, or do anything with graphics that you feel like doing.

Upon *Loading*, you are faced with a menu which allows you to either view the existing characters or draw your own. Drawing your own characters is simplified by an 8x8 grid. Moving the cursor around the grid and pressing '*1*' to mark that section of the grid, will allow a character to be drawn. Once completed, the character can replace any character on the keyboard, either in normal or reverse mode, and can be changed again easily if it is not suitable.

A further option allows you ■ build up larger blocks by using the smaller characters or the existing graphics. In fact there is a vast amount of scope with this program. Some of the nicer points about this cassette (a feature Pixel Productions excel in) is the neat instruction booklet accompanying the cassette and the professional layout of the screen during running the program.

I really can recommend this cassette, even to non-technical types like me who might be afraid it is a little too difficult for them to cope with. I have had lots of fun with this one and again the price of £7.95 seems exceptional when compared with some of the software around.

So, to conclude this excursion into the realms of computer versatility and to help answer the question . . . "But what does it *do*?", I have covered several different aspects of some of the better Vic software I have seen. As in all walks of life, the Vic buyer seems ■ be at the mercy of the sales pitch and software is not always 'better' if you pay more. ■

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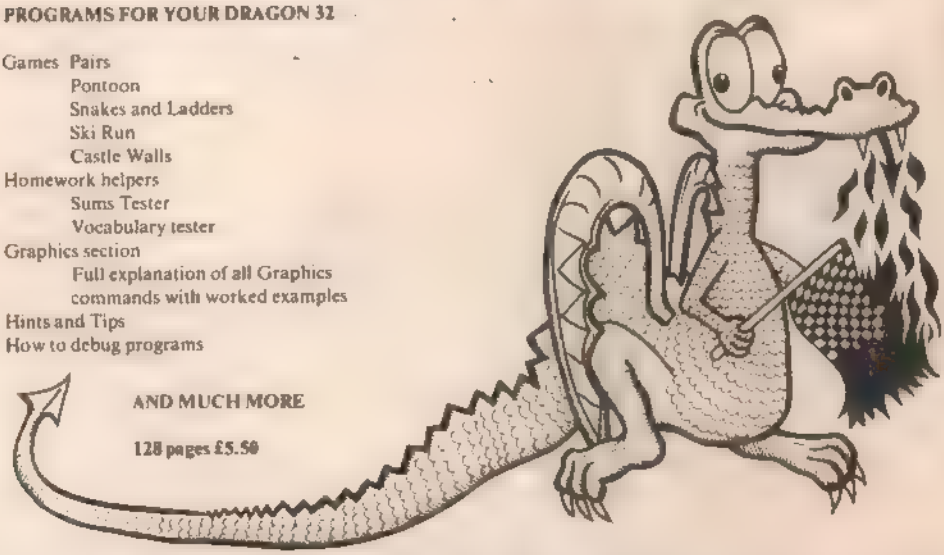

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Compiler

on ZX81

The following article develops and explains a 1K program which instantly and effectively translates a good subset of ZX81 Basic into machine code.

Many ZX81 owners would like to learn machine code but find it too difficult or don't have the time. Most ZX81 compilers are expensive and require 16K. My program only needs 1K to run and offers a real alternative to these people.

Type in the following:

```
10 INPUT R$
20 IF LEN R$ > VAL "4" THEN LET A = (CODE
   R$(VAL "5") - CODE "B") * VAL "2
25 IF LEN R$ > VAL "11" THEN IF R$(CODE "E")
   = "$" THEN PRINT
   "D9C0BB02444D511428F7C0BD077ED9";
   " 4F575F676F" (A TO A + SGN PI)
27 IF R$(SGN PI) = "F" THEN PRINT "06";
   R$(CODE "E");"(D)
30 IF R$(SGN PI) = "L" AND LEN R$ < VAL "9"
   THEN PRINT "3E161E262E" (A TO A + SGN
   PI); R$(VAL "7" TO VAL "8");"(D)
40 IF R$(SGN PI) = "L" AND LEN R$ > VAL "8"
   THEN PRINT ("3C141C242C" (A TO A + SGN
   PI) AND R$(VAL "8") = "+"),("3D151D252D
   (A TO A + SGN PI) AND R$(VAL "8") = "-")
45 IF R$(SGN PI) = "B" THEN PRINT "18XX
50 PRINT ("CF" AND R$(PI) = "0"); ("C7" AND
   R$(PI) = "W"); ("CD0E0C" AND R$(VAL "2" =
   "C")
60 IF LEN R$ > VAL "4" THEN IF R$(SGN PI) =
   "1" THEN PRINT "3E"; R$(VAL "7" TO VAL
   "8");" B9BABB8C8D" (A TO A + SGN PI),
   "20XX
70 IF NOT R$(SGN PI) = "P" THEN GOTO VAL
   "10"
80 FOR N = SGN PI TO LEN R$ - VAL "6"
90 PRINT "3E";CODE R$(VAL "7" + N); (D)D7"
100 NEXT N
110 GOTO VAL "10"
```

In order to make this program fit into 1K I've used every space-saving trick I know, ie using the *Val* function and *Pi* for numbers. Also instead of using:

```
IF R$(PI) = "0" THEN PRINT "CF"
IF R$(PI) = "W" THEN PRINT "C7"
IF R$(VAL "2") = "C" THEN PRINT "CD0E0C"
```

mould them all together and get:

```
PRINT ("CF" AND R$(PI) = "0"),("C7" AND R$(PI)
  = "W"); ("CD0E0C" AND R$(VAL "2") = "C")
```

When typing in some of the longer lines it might help to clear the screen before entering them. The same thing applies when you want to edit a line and the ZX81 won't let you. Simply clear the screen (*Cls*) press *Edit* and there's your line.

Run the program. You should be faced with a string input. You must follow the instructions very carefully.

The translator will convert the following commands into machine code.

```
LET PRINT "string" FOR-NEXT IF-THEN INKEY$
  GOTO SCROLL STOP NEW
```

You must remember that there are no strings in machine code: AS, BS, C$ don't exist. The only variables you may use are C, D, E, F and G. The next thing is very important; you must type out all commands and functions letter for letter including spaces. LET C = 45 would consist of eight separate characters.

When using conditional statements the *If* part must be followed by two spaces. The *If* statement can only compare a variable with a number and not a variable with another variable. Another restriction of conditional statements is that the *Then* must always be followed by a *Goto*. This is a restriction of machine code and not my program.

You may only add or subtract 1 from a variable. If you wish to subtract or add more you must use that number of +1 or −1 statements. *Print* may only be used in the form *Print* "string" not *Print At, Tab* or *Print* C, D, E, F, G.

Inkey$ may only be used in the format *Let* X = *Inkey$* (where X is either C, D, E, F or G). Note *Inkey$* returns the code of the key pressed.

There are no line numbers in machine code so enter your statement as if it was a direct command. This poses a problem when it comes to commands like *Goto* and *Next* and you will find my program prints two X's whenever these commands are used. You will have to work out what goes there yourself but it's really very easy. In machine code the only *Goto* instructions are *Goforwards* and *Gobackwards*. You will have to count the number of places it takes to get from the two X's to where you want to go.

Here is an example:

Basic	*M.c*
FOR C = 1 TO 8	06 08
PRINT ""A""	3E 26 D7
NEXT C	10 XX

In this case it takes 4 steps backwards (−4) to get from XX (end of *Next* C) to 3E (beginning of *Print* ""A""). Look up −4 in the following table and replace XX with FB.

−1	−2	−3	−4	−5	−6	−7	−8	−9	−10	−11
FE	FD	FC	FB	FA	F9	F8	F7	F6	F5	F4

To go forwards use the following table.

+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11
00	01	02	03	04	05	06	07	08	09	0A

If you find a D in brackets after a number it means that number is in decimal and you will have to look up the hex equivalent in the back of your ZX manual. Regarding all commands, make your program as simple as possible, complicated lines will not be translated properly. Always include a C9 instruction at the end of any M.c. program.

by Robin Wright

AV Timer

on Vic-20

An interesting conclusion I have come to having owned a computer for about eight months is that there are quite a lot of people who are 'into computers' who are also keen on photography.

I have been using the new type of chromogenic film (dye based instead of the old silver based film, a sort of black and white colour film) for about two years. As with temperature control the timing of the development of this film has to be much more accurate. The program started simply as an exercise in handling strings, and ended up as a very useful audio/visual timer to help processing films. It is also interesting to note that given the right peripherals this same program could be adapted to do the whole job itself.

Program notes

Line 30 — sets the volume and notes used for the audible warning.

Line 80 — gives me time to get downstairs to where I develop the films. After this if you don't want a time delay, it also starts the 'clock' at zero.

Lines 100 to 150 get the different parts of TI$ which represent minutes and seconds.

Lines 160 to 260 produce the value of the time in simple numeric form, and then direct the program to subroutines which sound at the start, and then at each minute and half minute, and at the times when developer must be tipped out and bleach-fix put in.

Line 270 simply slows down the program so that the flickering is not too noticeable.

Lines 290 on are the subroutines which sound on each minute etc.

```
10 REM TIMER PROGRAM
20 REM GEOFF CROWTHER, JAN 1983
30 V=36878 P=36875 W=36876
40 PRINT"□■■■■■    XP1   TIMER      ■"
50 PRINT"■■■■■■ YOU NOW HAVE A"
60 PRINT"■■  FEW SECONDS TO GET"
70 PRINT"■■ DOWNSTAIRS AND START"
80 PRINT"■■■  START ON THE TONE":
   FORI=1TO1000:NEXTI:TI$="000000"
90 REM STRING WORK
100 X$=RIGHT$(TI$,4)
110 Y$=LEFT$(X$,2)
120 PRINT"□■■■■"
130 PRINT"■■■■■";Y$;" MINUTES"
140 Z$=RIGHT$(X$,2)
150 PRINT"■■■■■";Z$;" SECONDS"
160 A=VAL(Y$)
170 B=VAL(Z$)
180 S$=RIGHT$(Y$,1)
190 G=VAL(S$)
200 IFA=10THENGOSUB320:END
210 IFG=0ANDB<5THENGOTO290
220 IFG=5ANDB<5THENGOTO290
230 IFA=4ANDB=45THENGOSUB320
240 IFA=9ANDB=45THENGOSUB320
250 IFB=0THENGOSUB350
260 IFB=30THENGOSUB350
270 FORI=1TO650:NEXTI
280 GOTO100
290 POKEV,0
```

Turn to page 19

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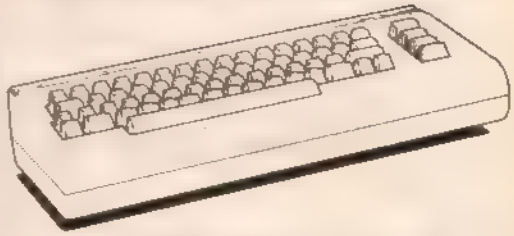

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From page 15

```
300 FORI=1TO50:POKEP,248:NEXTI:POKEV,0:
    POKEP,0
310 GOTO278
320 POKEV,15
330 FORI=1997TO2055STEP5:POKEN,I:FORJ=1TO50
NEXTJ:NEXTI:POKEV,0:POKEN,0
340 RETURN
350 POKEV,8
360 FORL=1TOP:POKEP,248:FORI=1TO100:NEXTI
370 POKEP,0:FORI=1TO100:NEXTI
380 NEXTL:POKEV,0:POKEP,0
390 RETURN

READY.
```

A/V Timer
by Geoff Crowther

Tape Decode

on Spectrum

This short program will "decode" the tape header used by the ZX Spectrum when loading programs from tape. I wrote the program so that unnamed or "secretly" saved programs may be loaded and listed. The program also determines the auto-start line number. It will run on 16K or 48K Spectrums. All the information required by the computer during loading is stored in a "header" which has 17 bytes and is audible after about ■ seconds.

The header contains the following information:

1) The type of program on tape, ie Basic or machine code etc.
2) The 10 character filename.
3) The length in bytes of machine code. (If Basic then the length plus variables.)
4) The Basic auto-run line number of a program or the first location of any machine code.
5) The length of Basic program.

The program *Pokes* a small machine code routine into memory, which loads 20 bytes from tape by calling the load routine at 0556 (Hex) with the number of bytes to be loaded in the DE register pair. The bytes are then decoded by the rest of the program.

A disassembled version of the routine is included. This routine sets the carry flag for loading, then sets the A register to 00. This means load A code block, sets the instruction register (IX) to 7D00 (Hex) as destination for the bytes from tape, sets DE with number of bytes to be loaded then calls the load routine and then returns to Basic.

The program runs continuously and decodes any header it encounters and could be relocated above ramtop and called when required.

```
  1 BORDER 1: PAPER 1: INK 6: C
LS 5 PRINT AT 2,6;" MACHINE CODE
 AT 3,6;"HEADER DISASSEMBLER";A
T 4,8;"BY MJB DEC 1982"
  6 PRINT AT 5,5;"START THE TAP
E NOW - AT 7,8;"THEN HIT A KEY"
  8 PAUSE 0
  10 CLEAR 32767
  15 FOR L=32768 TO 32781
  20 READ M: POKE L,M
  25 DATA 62,62,8,221,33,0,125,1
7,20,0,205,86,5,203
  35 PRINT AT 14,6;"LOADING HEAD
ER";AT 16,10;"PLEASE WAIT";AT 18
,6;"PRESS BREAK TO STOP"
  75 RANDOMIZE USR 32768
  80 CLS: PRINT AT 8,10;"HEADER
DATA"
  85 PRINT AT 2,0;"DATA ID ";
  90 PRINT AT 4,0;"FILENAME ";
  91 IF PEEK 32000=0 THEN PRINT
AT 2,15;"BASIC"
  92 IF PEEK 32000=1 THEN PRINT
AT 2,15;"NUMERIC ARRAY"
  93 IF PEEK 32000=2 THEN PRINT
AT 2,15;"CHARACTER ARRAY"
  94 IF PEEK 32000=3 THEN PRINT
AT 2,15;"CODE BYTES"
  101 PRINT AT 4,15;
  105 FOR B=32001 TO 32010
  110 PRINT CHR$ (PEEK B);
  115 NEXT B
```

Title Scrolling

On Spectrum

Program two is an interesting little routine to liven up games titles while you are reading the instructions. It plays with the *Chars* pointer value and rolls titles over and over themselves.

Program three stores an inverted, not inverse, character set ■ Ram. Do not be afraid to experiment with the contents of the addresses in chapter 25 of the manual, but not when you have a program you want in the memory — just in case you do crash your machine.

```
  20 FOR I=1 TO 7: POKE 23606,0
  30 PRINT AT 10,10;"PROGRAM 111
LS";
  40 PAUSE 7: NEXT 0
  50 FOR I=1 TO 0 STEP -1: POKE
 23606,I
  60 PRINT AT 10,10;"PROGRAM 111
";
  80 NEXT 0: GO TO 10
```

Title Scrolling
by Chris Wood

Character Set

On Dragon

The listing shown below will display all of the characters available to the Dragon user via *CHR$*. Careful examination of the screen will reveal that out of ■ possible 256 characters we only get 224. In fact the Dragon Manual lists only these same 224 characters.

```
10 CLS
20 FOR I = 0 TO 255
30 PRINT I; I, CHR$(I);
40 NEXT I
50 GOTO 50
```

How then can we rectify this loss, and indeed what are we losing? If we again look carefully at the display, we will see that in the inverse video mode (green on black) only the letters and a few of the characters are present. Indeed there is not even a black space to use with the letters; and *CHR$*(128) tends to give ■ deeper black.

The answer is simply to *Poke* the characters to the screen. Enter line 35 below and re-run the program to see the full set that each approach will produce.

```
35 POKE 1280 + I, I
```

by Kevin Thomas

```
120 LET A=PEEK 32011: LET B=PEE
K 32012
125 LET N=A+(B*256)
130 LET A=PEEK 32013: LET B=PEE
K 32014
135 LET M=A+(B*256)
140 LET A=PEEK 32015: LET B=PEE
K 32016
145 LET D=A+(B*256)
150 PRINT AT 6,0,"CODE LENGTH:"
;AT 6,15;N
160 PRINT AT 8,0,"START CODE:";
AT 8,15;M
165 IF PEEK 32000=0 THEN PRINT
AT 10,0;"START LINE:";
170 PRINT AT 10,0,"BASIC LENGTH
";AT 10,15;D;AT 20,0,
1510 GO TO 60
```

```
7FED 3E37      LD    A,37
7FEF 3E00      LD    A,00
7FF1 DD21007D  LD    IX,7D00
7FF5 111400    LD    DE,0014
7FF8 CD5605    CALL  0556
7FFB C9        RET
7FFC 00        NOP
```

Tape Decode
by M. Smith

Space Bomber

on BBC Micro

The object of this game is to stop the bombs being dropped from the top of the screen and hitting the ground around your base. To do this you move your base left and right along the bottom of the screen and fire missiles at the descending bombs. The game ends when one of the bombs manages to get to ground level. When this happens you are first thoroughly blown up and then your score is displayed.

This program is slightly unusual in that it runs in *Mode 7*, not in one of the graphics modes, and does everything by *Poking* the Ascii codes of the characters to be displayed straight into the screen memory.

In spite of the fact that there is only one bomb on the screen at any one time, this game has been found to be very addictive by the people who have tried it.

Program notes

Lines	
10	Sends the computer to the 'Title Page' section of the program which then returns it to line 20.
20 to 110	Set up the variables and the screen display
120	Is the beginning of the main loop.
130	Is obvious
140 to 150	Displays your score and the elapsed time.
160	Passes control to the appropriate part of the program depending on the key pressed, ie left, right, or fire.
170	Fires a missile from your base.
180	Explodes the missile if it hits a bomb.
190 to 210	Moves your base.
220	Is a delay loop to prevent the bombs from slowing down when you fire a missile.
230	Moves the bomb and tests to see if it has hit the ground

Turn to page 20

OPEN FORUM

From page 19

249 Tests to see if bomb has been destroyed and, if so, drops a new bomb.
250 Is the last line of the main loop (*Until False* means forever).
260 to 360 Destroy your base and display your score when you let a bomb penetrate your defences.
370 to 430 Display the 'Title Page'.

Variables

A — present position of base in the screen memory above HIMEM.
AA — previous position of base in the screen memory above HIMEM.
B — position of bomb in screen memory above HIMEM.
I — position of missile in screen memory above HIMEM (only used for this purpose in lines 170-190 otherwise used as general loops).
S — number of bombs destroyed

```
5 REM ***COPYRIGHT C.HILL ***
10 GOTO 370
20 A=940:AA=940:S=0
30 CLS
40 FOR I=0 TO 880 STEP 40
50 ?(HIMEM+I)=130:NEXT I
60 ?(HIMEM+920)=132:?(HIMEM+960)=132
70 ?(HIMEM+40)=129
80 B=RND(149):IF B<129 THEN 80
90 ?(HIMEM+A)=65
100 FOR I=969 TO 989:?(HIMEM+I)=255:NEXT I
110 FOR I=89 TO 109:?(HIMEM+I)=255:NEXT I:TIME=0
120 REPEAT:M=INKEY(15-TIME DIV 1000):*FX 15 0
130 SOUND 1,-10,80,2:SOUND 1,-10,50,2
140 PRINTTAB(1,1);TIME DIV 100;" SECONDS "
150 PRINTTAB(30,1);S;" BOMBS";
160 IF M=32 THEN I=A-40:GOTO 170 ELSE IF M=90 OR M=47 THEN 190 ELSE 230
170 I=I-40:IF ?(HIMEM+I)=42 THEN 180 ELSE ?(HIMEM+I)=33:?
    (HIMEM+I+40)=32:IF I>16
0 THEN 170 ELSE ?(HIMEM+I)=32:GOTO 230
180 SOUND 0,-15,5,5:?(HIMEM+I+40)=32:?(HIMEM+I-1)=131:?
    (HIMEM+I)=255:FOR G=1 TO
500:NEXT G:?(HIMEM+I-1)=130:?(HIMEM+I)=32:S=S+1:GOTO 230
190 IF M=90 AND A>929 THEN A=A-1
200 IF M=47 AND A<949 THEN A=A+1
210 ?(HIMEM+AA)=32:?(HIMEM+A)=65:AA=A
220 FOR G=0 TO 100:NEXT G
230 IF ?(HIMEM+B)=42 AND B<879 THEN ?(HIMEM+B)=32:?
    (HIMEM+B+40)=42:B=B+40:GOTO 
50 ELSE IF B>879 THEN 260 ELSE 240
240 B=RND(149):IF B<129 THEN 240 ELSE ?(HIMEM+B)=42
250 UNTIL FALSE
260T=TIME DIV 100
270MODE 5:VDU 19,128,14,0,0,0
280SOUND  0,-15,6,5
290FOR G=1 TO 1000 : NEXT G : MODE 7
300PRINTTAB(4,10)CHR$129"YOU MISSED IT , TOO BAD"'CHR$131"
   BUT YOU LASTED FOR ";T;" SECONDS"'CHR$131"AND DESTROYED ";S;" BOMBS"
310IF T+S>10 THEN PRINT CHR$129;SPC(8);"WELL DONE" ELSE PRINT
   CHR$133;SPC(6);"NOT SO GOOD"
320PRINT TAB(2,24)"PRESS ANY KEY TO START AGAIN"
330*FX 15 0
340FOR G=0 TO  500 : NEXT 
350SOUND  0,-12,RND(3)-1,10
360IF INKEY(10)=-1 THEN 350 ELSE RUN
370MODE 7
380FOR G=7 TO 8
390PRINT TAB(8,G)CHR$129;CHR$141;"SPACE BOMBER"
400NEXT G
410PRINT TAB(3,19)"PRESS Z TO MOVE LEFT"''"   PRESS / TO MOVE RIGHT"''"
   PRESS THE SPACE BAR TO FIRE"''"   PRESS ANY KEY TO START"
420*FX 15 0
430Z=GET:GOTO 20
```

Space Bomber
by C. Hill

Voyager

on Vic-20

This program is for the Vic20 with Super Expander. It provides a simulation, in hi-res, of Voyager II flying past Saturn then passes by Voyager's cameras.

When the program is run some information about the Voyager is displayed before the simulation begins. Other information about Voyager's anatomy can be found within the program.

After Voyager has flown by there is a short delay before Saturn appears. A musical scale is played just before it appears.

Voyager
by Kevin Boyd

```
1 REM    WRITTEN BY       KEVIN  BOYD.
2 REM
10 COLOR0,0,5,1:GOSUB5000
20 ORAPHIC3:GOSUB3000:POKE36881,160
21 FORS=1TO20:A=INT(RND(1)*1023):B=INT
   (RND(1)*1023):POINT2,A,B:NEXT
30 CIRCLE2,511,511,500*.7,500
40 CIRCLE2,511,510,400,40,92,60
45 CIRCLE2,511,530,450,60,92,60
50 CIRCLE2,511,550,500,100,88,63
55 REM CIRCLE2,511,570,550,120,88,63
60 REGION"
70 PAINT2,511,300
80 PAINT2,511,800
85 GOTO900
90 FORX=500TO1000STEP5
100 CIRCLE2,511,511,X*.7,X,58,100
110 CIRCLE2,511,511,X*.7,X/3.47
120 NEXT
530 PRINT"MX-BAND DATA RATE, AT
    SATURN=44,800 BITS/SEC"
900 PRINT"$302CDEFGABO3C"
1000 FORS=160TO338STEP-0.05
1100 POKE36881,S:NEXTS
1200 FORD=1TO1000:NEXTD
1300 FORS=0TO12STEP0.05
1400 POKE36880,S:NEXTS
1500 FORD=1TO7000:NEXTD
2000 END
3000 POKE36881,160
3005 REM HIGH-GAIN DIRECTIONAL ANTENNA
3010 CIRCLE2,511,511,100*.7,100
     CIRCLE2,511,511,20*.7,20
3020 DRAW2,470,470TO490,490 DRAW2,540,
     470TO520,490 DRAW2,470,550TO490,530
3025 DRAW2,540,550TO520,530
3027 REM EXTENDABLE       BOOM
3030 DRAW2,505,515TO900,515TO900,505TO585,505:PRINT2,700,511
3035 REM PLANETARY       RADIO ASTRONOMY AND PLASMA WAVE ANTENNA
3040 DRAW2,540,600TO755,900 DRAW2,480,600TO305,900
3045 REM RADIOISOTOPE          THERMOELECTRIC          GENERATOR
3050 DRAW2,515,610TO515,800TO495,800TO495,1000TO540,1000TO535,800TO515,800
3055 REM DETECTOR ARM
3060 DRAW2,515,410TO515,100
3070 CIRCLE2,490,100,20*.7,20 DRAW2TO530,100:CIRCLE2,540,100,20*.7,20
3100 FORS=160TO338STEP-0.05
3110 POKE36881,S:NEXTS
3150 FORD=1TO2000:NEXTD
3200 FORS=12TO0STEP-0.05
3210 POKE36880,S:NEXTS
3500 FORS=38TO0STEP-0.05
3310 POKE36881,S:NEXTS
3320 SCNCLR:RETURN
5000 PRINT"[RVS]      [OFF]VOYAGER II"
5005 PRINT"[RVS]      [OFF]"
5010 PRINT"[RVS]WEIGHT = 930KG"
5020 PRINT"[RVS]DATA STORAGE = 538    MILLION BITS"
5030 PRINT"[RVS]X-BAND DATA RATE,AT   SATURN=44,800 BITS/SEC"
5040 PRINT"[RVS]DIAMETER , HIGH GAIN  ANTENNA  3.7M"
5050 PRINT"[RVS]THERMOELECTRIC GENERAT-OR AT SATURN APPROXIA-MATELY 400W"
5060 PRINT"[RVS]PRESS ANY KEY TO START"
5070 POKE198,0:WAIT198,1
5080 RETURN
```

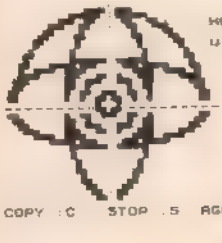
Eclipse

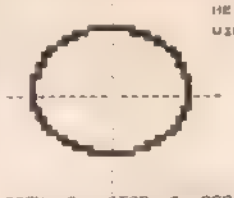
on ZX81

This program, for the 16K ZX81, will draw an ellipse of a specified height and width, from any given starting position to any given finishing position.

Variables used

- a: width of ellipse
- b: height of ellipse
- c: start position
- d: finish position
- o: angular displacement in radians
- x: plot co-ordinates
- y: plot co-ordinates
- f: sets up axis






```
   REM ELLIPSE
  10 PRINT AT 20,0;"
  20 PRINT AT 20,0;" INPUT WIDTH
  30 INPUT A
  40 PRINT AT 20,5;"HEIGHT"
  50 INPUT B
  60 PRINT AT 20,0;"START "
  70 INPUT C
  80 PRINT AT 20,0;"FINISH"
  90 INPUT D
 100 PRINT AT 20,0;"
 110 REM DRAW AXIS
 120 FOR F=0 TO 20
 130 PRINT AT 10,F;"-"
 140 PRINT AT F,10;":"
 150 NEXT F
 160 REM DRAW ELLIPSE
 170 LET C=C/180*PI
 180 LET D=D/180*PI
 190 FOR O=C TO D STEP .02
 200 LET X=A*COS O+20
 210 LET Y=B*SIN O+23
 220 PLOT X,Y
 230 NEXT O
 240 PRINT AT 0,20;"HEIGHT ";B;A
T 4,20;"WIDTH ";A
 250 PRINT AT 20,0;" COPY :C   S
TOP :S  AGAIN :A"
 260 IF INKEY$="C" THEN COPY
 270 IF INKEY$="S" THEN STOP
 280 IF INKEY$="A" THEN RUN
 290 GOTO 260
```

Ellipse
by William Meadowcroft

Pencil

on ZX81

Ask your computer to multiply a 14 figure number by another 14 figure number, and it will not be dismayed by the problem; a couple of seconds, and the answer appears. So what is the problem? The answer is only partially correct; it has been rounded to 8 figures, and to add to the confusion it is expressed in Exponent Notation. How often do you need to multiply such large numbers and arrive at an exact answer? Not often.

However, a 6 figure number multiplied by a 3 figure number will produce a 8 figure answer, and even this will be rounded to 8 figures. The self-inflicted task was to write a program that would deal with any sum from 2 × 2 up to as large as the screen will hold, and to set the numbers out correctly on the screen.

The task proved to be far more difficult than expected, because no functions like *Val* could be used if they were to be applied to numbers greater than 8 figures; they too have the rounding off syndrome. This is where the pencil and paper come in. To achieve the desired result, the computer has to be made to proceed just as a mere mortal would with pen and pad.

To be able to print the numbers where

Turn to page 23

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required on the screen, it is useful to know the length of the numbers, so strings were the obvious choice to hold them. As soon as a string had been established it was followed by a simple variable set to the length of the string, and bearing the same name as the string.

```
10 INPUT A$
20 LET A = LEN A$
```

or

```
30 DIM D$ (B, A = B)
40 LET D = LEN D$ (B)
```

Notice that the *Len B$* and *Len A$* have been used in dimensioning D$, they are also used as mentioned in setting *Print* positions.

```
■ PRINT AT 3 + B, 18 - A; A$
```

The lengths of the various lines are also related to the lengths of the numbers.

Having checked the inputs, printed them on the screen, and drawn a line under them, before multiplication can begin, a string array must be dimensioned to hold the answers for addition later. The first subscript (the number of strings) is easy; it is the same as the length of the multiplier. The second (the length of the string) requires a little forethought. If a typical sum is written down thus:

```
      3 5 2 4 × 5 3 4 1
      5 3 4 1
      -------
      3 5 2 4
    1 4 0 9 6 *
  1 0 5 7 2 * *
1 7 8 2 0 * * *
```

All of the spaces occupied by "*" should be filled with zeros to give each answer the correct value (when using pencil and paper some people put them in as an aid to the alignment of the columns). The job of multiplying each answer by the appropriate power of 10 is simple, but we cannot allow the computer to do it for us because of — you guessed — rounding off.

The zeros must be added to the numbers by putting them into the strings, hence the strings are dimensioned to take the longest number plus the required number of zeros. This just happens to be the combined lengths of the multiplier and multiplicand.

The computer must now work as with pencil and paper, and multiply the last figure of the upper number by the last figure of the lower number. The units of the result must be printed on the screen, and put into the correct string. The carry, if any, must be noted. The answers to each multiplication can be the same length as the multiplicand, or one digit longer. The loop performing this task must be the same length as the multiplicand, so that when leaving the loop, and before re-entry, it deals with the next figure in the lower number. The carry (if it is not zero) is printed also. The carry, whatever its value, is put into the string.

This manoeuvre keeps the occupied length of each string the same, and makes life easy later on. When the zeros are added to the strings, the addition can start at the same point in each string. The shorter numbers will carry a leading zero, which pads them out to the same length as the longer numbers without affecting their value.

The multiplication procedure is repeated until complete, when a line is drawn under the sum. A loop is now entered to add the appropriate number of zeros to each string, after which the first string will contain a number and lots of zeros. The last string will have a number and lots of spaces. Those in between will have a combination of ■ three. Another loop, this program has them all, performs what may seem a very odd function. It takes each string in turn, and looks at the last character. If this is ■ space, it adds a zero to the front of the string and pushes the space off the other end. This is repeated until ■ of the spaces are gone. It then turns ■ attention to the next string, until ■ strings have been dealt with.

All the numbers are moved up their respective strings until their units are at the end of the string, and nicely aligned for the addition which is about to follow. Yet another loop, in fact a loop within a loop, attends to the addition, starting from the units end of the strings, and printing the answers as it proceeds. The 28 figure answer complete, a final loop draws a double line to finish things off, and the ZX81 asks for another sum.

The program is not fast; a reader may even write in to say he or she can do it faster with pencil and paper. My money would be on the computer producing the right answer. The program can be run *Fast*, but this will deprive you of the pleasure of seeing your ZX81 earning its keep, digit by digit.

by W. Googe

Layouts

on Dragon

If you own a Dragon, and can get access to a printer, you will find this program useful.

The program is in two parts. The first part (lines 20-150) prints a screen layout chart, as shown in Figure 1. The alphabetic line at the bottom is provided to assist in centering headings, etc. This part of the program could be run twice on the A4 sheet, to produce a master for photocopying.

The second part of the program prints a table, as in Figure 2, of the numbers to be used in *Print @* statement ■ order to cause printing at any desired position. This requires a printer capable of printing 132 characters on a line. This is set on the Oki Microline printer by sending *Chr$(29)* to the printer (line 180).

```
10 'DRAGON LAYOUTS Copyright T P Goldingham 1983
20 'screen
30 PRINT#-2,CHR$(31):PRINT#-2:PRINT#-2,TAB(16)"DRAGON"
40 PRINT#-2:PRINT#-2:PRINT#-2,TAB(13)"SCREEN LAYOUT"
50 PRINT#-2,CHR$(30):PRINT#-2:PRINT#-2
60 A$=" 0 1 2 3 4 5 6 7 8 9"
70 PRINT #-2,TAB(7)A$;A$;A$;" 0 1"
80 FOR J=0 TO 15
90 PRINT#-2,USING"##";J;:PRINT#-2,TAB(7)CHR$(124);
100 FOR K=0TO 31
110 PRINT#-2, CHR$(95);CHR$(124);
120 NEXT K
130 PRINT#-2
140 NEXT J
```

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```
150 PRINT:PRINT#-2,TAB(7)" P O N M L K J I H G F E D C B A
    A B C D E F G H I J K L M N O P"
160 'print @
170 PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2,CHR$(31);
    TAB(16)"PRINT @"
180 PRINT#-2,CHR$(29):PRINT#-2:PRINT#-2
190 A$="   0   1   2   3   4   5   6   7   8   9"
200 PRINT#-2," "A$;A$;A$;"   ■   1":PRINT#-2
210 FOR J=0 TO 15
220 PRINT#-2,USING"##";J;
230 FOR K=1 TO 32
240 PRINT #-2,USING " ###";X;
250 X=X+1
260 NEXT K
270 PRINT #-2
280 NEXT J
290 CLS:PRINT"PRINTING COMPLETED"
```

Figure 1

DRAGON
SCREEN LAYOUT

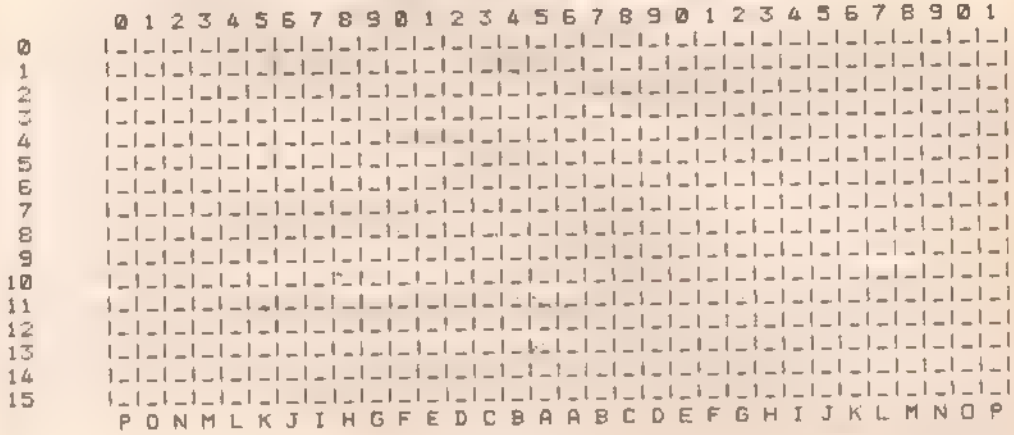
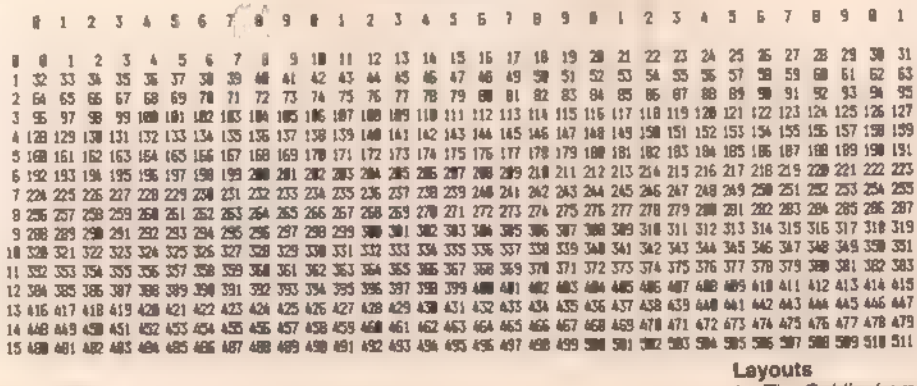


Figure 2

PRINT @



Layouts
by Tim Goldingham

Swat

on BBC Micro

Swat is a real time graphics game for the BBC micro, model A or B. You control a fly swat with the cursor control keys. You have to manoeuvre it over one of the two moths, and then hit it by pressing the *Tab* key at the right moment. If you succeed in hitting a moth it will be printed on the top line and removed from the game.

The object is to hit two moths in as short a time as possible. Time is kept at the top right of the screen. On running you are asked at what speed you would like to play the game. The question indicates that a number between 1 and 10 is required, but the greater numbers can be input to slow the game down even more. To stop this add:

```
15 IF SPEED<1OR SPEED>10 THEN GOTO10
```

NB. Those with OS 1.0 may have to change line 80 to

```
VDU 23, 1,0;0;0;0;
```

This simply tidies things up by switching off the flashing cursor. See User Guide page 77.

```
  5 REM SWAT-V2 ** S.LINDSAY
 10MODE7:PRINT''''CHR$(586);:INPUT
"FAST OR SLOW (1-10) ",speed
 20 *FX4,1
 30*FX11,1
 40*FX12,1
 50 XM%=4:YM%=20:AX=10:BX=10:TX=18:
UX=20
 60 HITS=0:TIME=0
 70 MODE5
 80 VDU23;8202;0;0;0;
 90 VDU19,0,3,0,0,0,19,1,2,0,0,0,19,
2,4,0,0,0,19,3,1,0,0,0
100 ENVELOPE2,1,0,0,0,0,0,0,0,-1,-2,
-3,126,100
110VDU23,224,4,10,125,138,134,64,32,16
120VDU23,225,32,80,190,81,97,2,4,72
130VDU23,226,16,8,7,2,28,32,0,0,0
140VDU23,227,8,16,224,64,56,4,0,0
150 VDU23,228,24,24,24,24,24,24,24,24
160 VDU23,229,170,85,170,85,170,85,
170,85
170 VDU23,230,3,12,20,42,36,24,6,6
180 VDU23,231,192,48,40,84,36,24,
96,96
190 A$=CHR$(224)+CHR$(225)+CHR$(10)
+STRING$(2,CHR$(8))+CHR$(226)
+CHR$(227)
200 B$=CHR$(228)+CHR$(10)+CHR$(8)+
CHR$(229)+CHR$(10)+CHR$(8)+CHR$(230)
210 C$=CHR$(230)+CHR$(231)
220 PROCBOX
230 REPEAT
240 PROCCOORD
250 FOR I%=1 TO 12
260 COLOUR1
270 IF A$="" THEN 290
280 AX=AX+XX:BX=BX+YX
290 IF C$="" THEN 310
300 TX=TX+XX:UX=UX+XX
310 IF AX>19 AX=1
320 IF AX<1 AX=19
330 IF BX>28 BX=5
340 IF BX<5 BX=28
350 IF TX>19 TX=1
360 IF TX<1 TX=19
370 IF UX>29 UX=5
380 IF UX<5 UX=29
390 IF A$<>"" PRINTTAB(AX,BX);A$
400 IF C$<>"" PRINTTAB(TX,UX);C$
410 T=TIME:REPEAT UNTIL TIME>T+speed:t
$=INKEY$(0)
420 IF A$<>"" PRINTTAB(AX,BX);"  "+
CHR$(10)+STRING$(2,CHR$(8));"  "
430 IF C$<>"" PRINTTAB(TX,UX);"  "
440 PROCMOVESWAT
450 PROCTI
460 NEXT
470 UNTIL FALSE
480 DEFPROCCOORD
490 DIR=RND(4)
500 IF DIR=1 XX=-1:YX=-1
510 IF DIR=2 XX=1:YX=1
520 IF DIR=3 XX=-1:YX=1
530 IF DIR=4 XX=1:YX=-1
540 ENDPROC
550 DEFPROCBOX
560 GCOL0,2
570 PRINTTAB(1,4);STRING$(18,"_");
580 MOVE820,890:DRAW1200,890:DRAW
1200,1000:DRAW820,1000:DRAW820,890
590 VDU5:MOVE890,990:PRINT"TIME"
:VDU4
600 ENDPROC
610 DEFPROCTI
620 PRINTTAB(13,3);INT(TIME/100)
630 ENDPROC
640 DEFPROCMOVESWAT
650 COLOUR3
660*FX15,1
670 PRINTTAB(XM%,YM%)" "+CHR$(10)+
CHR$(8)+" "+CHR$(10)+CHR$(8)+" "
680 IF B%=&88 THEN XM%=XM%-2
690 IF B%=&89 THEN XM%=XM%+2
700 IF B%=&8A THEN YM%=YM%+2
710 IF B%=&8B THENYM%=YM%-2
720 IF B%=&09 THEN PROCHITM188
730 IF XM%<1 THEN XM%=1
740 IF XM%>19 THEN XM%=19
750 IF YM%<5 THEN  YM%=5
760 IF YM%>28 THEN YM%=28
770 PRINTTAB(XM%,YM%);B$
780 ENDPROC
790 DEFPROCHITM(S%)
800 SOUND0,2,S%,1
810 IF A$<>"" AND(AX=XM%) AND
(B%=YM% OR B%=YM%+1 OR B%=YM%+2) THEN
PRINTTAB(1 0,3)A$:A$="":GOTO 840
820 IF C$<>"" AND (TX=XM%) AND (UX
=YM% OR UX=YM%+1 OR UX=YM%+2) THEN
7,3)C$:C$="":GOTO840
830 ENDPROC
840 HITS=HITS+1
850 PRINTTAB(2,3)"HIT!"
860 VDU19,0,1,0,0,0:SOUND1,-15,230,
20:T=TIME:REPEAT UNTIL TIME>T+150:
TIME=T:VDU19,0,3,0,0,0
870 IF HITS=2 THEN PROCFIN
880 ENDPROC
890 DEFPROCFIN
900 *FX11 8
910 *FX15,1
920 SC=INT(TIME/100)
930 TIME=0:REPEAT UNTIL TIME=800
940 CLS:COLOUR3:PRINT''''''  ** GAME
OVER **"
950 COLOUR1:PRINT''''"Your Time Was
";SC;" S.""""ON SPEED ";speed
960 COLOUR2:PRINT''''"ANOTHER GAME";R$
=GET$:IF R$="N" THEN END ELSE RUN
```

Swat
by Stephen Lindsay

Line

on Dragon

As a Dragon owner for some two months, one of my favourite commands is *Line*. As well as drawing lines and boxes, the *Line* command can be used to create some interesting and often complicated patterns.

This program demonstrates how *Line* can be used to draw curves and triangles, with a 'lacy' effect.

Variables used
A — Random start position between each pattern.
B — Random screen start.
C — Random line colour.
D — Loop control.
DLAY — Delay between each pattern.
To add colour to the display add the following:

```
 10 PMODE 3, 1
 72 C = RND(8) - 1:1 then 72
 75 Color C, 1

  5 REM TRIANGLES AND CURVES
 10 REM (C) C.A STONE 1982
 20 PMODE 4,1
 30 D = RND (75)
 40 B = RND (255)
 50 SCREEN 1,1
 60 PCLS
 70 FOR A = 1 TO 255 STEP 3
 80 LINE (B,A) – (A,D), PSET
 90 LINE (B,A) – (A,D + 50), PSET
100 LINE (B,A) – (A,D + 100), PSET
110 NEXT A
120 FOR DLAY = 1 TO 1000: NEXT
130 GOTO 60
```

by C. Stone

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1) Each entry must consist of a ZX printout and your name and address.
2) Closing date for this month's *Cruising Challenge* entries is March 31.
3) The highest score each month will receive £10.
4) High scores cannot be transferred from one month to another.
5) The judges' decision is final.
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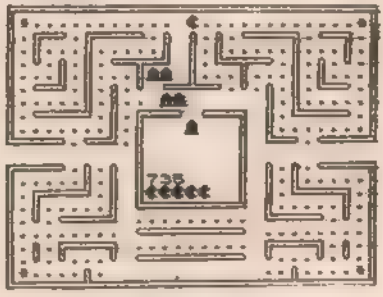


Walking the wires

***Peter Donn** explains how to use an analogue to digital converter as a voltmeter.*

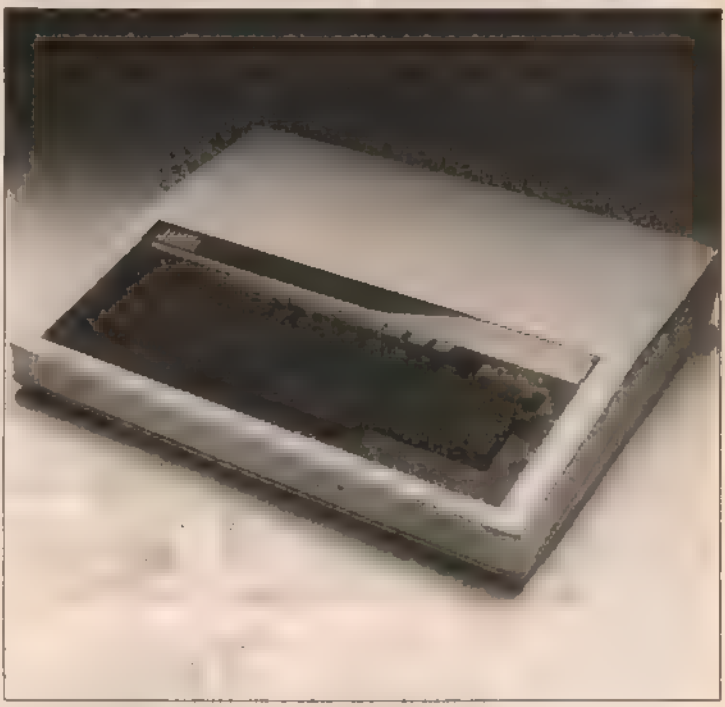
The following program for the BBC model B enables you to test the voltages of any battery up to 1.8 volts. The only additional hardware needed are two small, thin wires and the batteries to be tested.

When Run, the program will display an analogue and digital readout of the voltage of the battery. With no battery connected, the readouts will be apparently random. Do not worry, your machine is perfectly alright — it is just the internal parts of the digital to analogue converter working hard!

It would be preferable to use proper plugs to connect your wires to the converter, but most model B owners just do not have any lying around. You can do what I do — push the wires into the appropriate holes, carefully. Don't worry, I won't tell Acorn. You need two wires coming from the following holes on your converter:

When you connect the other ends of the wires to the poles of the battery, wire *A* goes to the negative terminal and wire *B* to the positive. Do *not* use voltages such as that on a PP3 battery for example, that are higher than 1.8 volts.

The program does not have any particularly strange features, except for the **FX* on line 30, which makes sure analogue conversion is only on one channel, the use of selected print format, line 40 (see manual under 'PRINT'), the character definition on line 50 and of course the taking of analogue readings on line 250. ■



```
 10 REM COMPUTERMETER — © PETER DONN, NOVEMBER 1982
 20 MODE1
 30 *FX16,1
 40 @%=&0002020A
 50 VDU23;8202;0;0;0;19,3,2;0;19,2,4;0;19,1,3;0;23,224,0,0,32,96,255,255,96,32
 60 COLOUR2
 70 PRINTTAB(20,8);"POTENTIAL";TAB(20,10);"DIFFERENCE";TAB(20,12);"IS";TAB(20,18);"VOLTS"
 80 VDU5
 90 GCOLO,3
100 MOVE200,900:PRINT"VOLTS"
110 MOVE370,765:DRAW370,250
120 B=0
130 FORA=250 TO 800 STEP56.83
140 MOVE0,A+20:PRINTB
150 B=B+0.2
160 MOVE336,A+32:PRINT"—"
170 NEXT
180 GCOLO,1:MOVE100,100:DRAW100,950:DRAW1100,950:DRAW1100,100:DRAW100,100
190 GCOL3,1
200 A%=65520:B=1.8
210 Z%=-1
220 REPEAT
230 TIME=0:REPEAT:UNTILTIME>30
240 MOVE385,Z%:PRINTCHR$224
250 P=ADVAL(1)/A%*B
260 C=270+(P*286.11)
270 MOVE385,C
280 Z%=C
290 PRINTCHR$224
300 VDU4:COLOUR1:PRINTTAB(20,15);P:VDU5:GCOL3,1
310 UNTILFALSE
```

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I turned the cat in the pan once more and so. . .

***Nick Godwin** presents a copycat program for the 16K and 1K Sinclair ZX81.*

One ■ the problems of using *Plot* and *Unplot* to produce images ■ that they are not easily copied into strings for storage and subsequent recall. The obvious way of doing this ■ to scan the display file, which is a slow business in Basic. Also, there is the constant danger of accidentally pressing *Break* and losing the image altogether.

In an attempt to solve this problem, I wrote a program which records the successive *Plot* and *Unplot* co-ordinates as the image is being drawn, so that it could later be reconstructed. It was when I accidentally ran such a program to reconstruct an image in *Slow* mode, that I noticed an interesting effect. This program ■ designed to take advantage of that effect.

The program as it is presented here, although a complete entity ■ itself, by no means constitutes a full exploration into the potential offered by the technique. I have tried to design the program ■ a way that will allow the reader first to easily comprehend the principles on which it works, and then ■ adapt and develop this for his or her own purposes.

The program is simple enough to operate. It is constructed in two parts — the first part, accessed by Run, consists of a drawing board with 8-directional control using unshifted keys *I* to ■. Pressing any other key will cause the program ■ change mode from *Plot* to *Unplot*, or vice versa. When ■ drawing is completed, press *Break*.

The second part of the program starts at line 300, and ■ accessed by the command: *Goto* 300. It is fascinating to see the image being reconstructed exactly as you originally entered it, after which it reverts to the former mode and the user can continue drawing. Creative programming can further enhance the effects, by incorporating other controls, such as *Scroll* and *Cls* into the drawing board, and having these encoded into the string for "playback" later.

To do the program justice, a 16K Ram pack ■ needed. However, I have also included a much simplified version adapted for the 1K machine, which will at least offer a taste of the possibilities to those who are wholly reliant upon on-board Ram. And ■ further accident revealed a very interesting additional effect which can only work on the 1K version (and for which the drawing needs to be restricted to the left-hand side of the screen).

```
1 GOTO VAL "100"
2 PLOT X,Y
3 RETURN
```

```
100 LET A$=" UNPLOT
110 POKE VAL "16525",CODE A$
120 LET X=CODE  3
130 LET Y  CODE  "
140 SLOW
150 PLOT X,Y
160 UNPLOT X,Y
170 IF INKEY$ "  THEN GOTO VAL "150"
180 GOSUB VAL "■
190 LET Z=VAL " CODE INKEY$  ■
200 IF Z>VAL "8  THEN GOTO VAL "150
210 LET X=VAL  X+(X<63)*(Z=2 OR Z=3 OR
    Z=8)-(X>0)*(Z=1 OR Z=4 OR Z=5)"
220  LET Y=VAL "Y+(Y<43)*(Z=1 OR Z=2 OR
    Z=7)-(Y>0)*(Z=3 OR Z=4 OR Z=6)
230 LET A$=A$+CHR$ X+CHR$ Y
240 GOTO VAL "150
250 LET Z=VAL  16525
260 POKE Z,VAL  PEEK Z+6*((PEEK
    Z=246)-(PEEK Z=252))
270 GOSUB VAL "2
280 LET A$=A$+CHR$ PEEK Z
290 GOTO VAL "150"

300 SLOW
320 FOR J=VAL "1" TO LEN A$
330 IF CODE A$(J) >VAL "■" THEN GOTO VAL
    "400"
340 LET X=CODE A$(J)
350 LET Y=CODE A$(VAL "J+1")
360 LET J=VAL "J+1"
370 GOSUB VAL "2
380 NEXT J
390 GOTO VAL "150
400 POKE VAL "16525",CODE A$(J)
410 GOTO VAL "370
```

The first part of the 1K program 100 to 170, should be entered and run. Then (usually following report code 4), those lines should be deleted and the new lines 100-120 should be entered and operated (by *Goto*, not by Run).

```
100 PLOT X,Y
110 IF INKEY$ "  THEN GOTO VAL "110"
120 LET X=X+(INKEY$="2" OR INKEY$="3" OR
    INKEY$="6")-(INKEY$="1" OR INKEY$="4"
    OR INKEY$="5")
130 LET Y=Y+(INKEY$="1" OR INKEY$="2" OR
    INKEY$="7")-(INKEY$="3" OR INKEY$="4"
    OR INKEY$="6")
140 LET A$(J)=CHR$ X
150 LET A$(VAL "J+1")=CHR$ Y
160 LET J=VAL "J+2
170 GOTO VAL "100
```

To operate this program, first assign values ■ *J*, *X* and *Y*, ■:

```
LET J=3 (J must start off ■ 3)
LET X=10 (X and Y values optional ■ Plot)
LET Y=10
```

Also, an array must be *dimmed*. I have found the optimum length to be about 150 bytes. Keeping as far as possible to the left of the screen helps make the memory go further, so you can have a longer string, eg:

```
DIM A$(150)
```

Now do the following commands

```
LET A$(1)=CHR$ ■
LET A$(2)=CHR$ ■
SLOW
GOTO 140
```

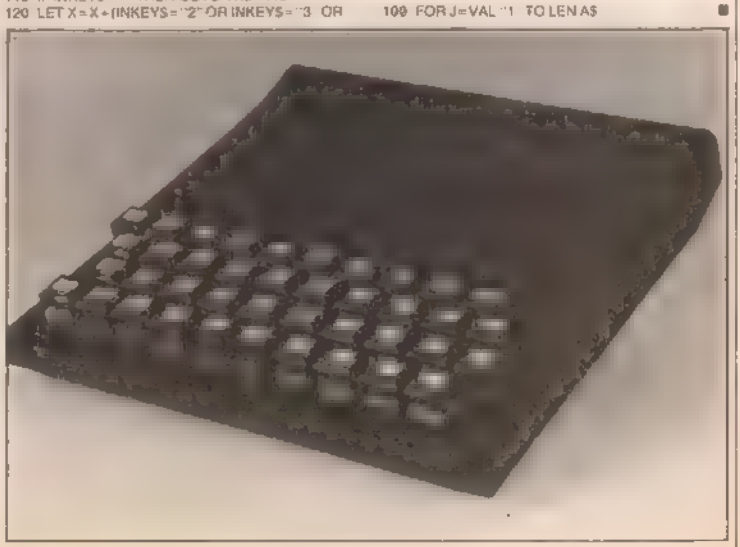
Start drawing and remember, keeping as far as possible (but not too far!) to the left makes the Ram go further. When your drawing is finished, press *Break* (if you have not already got report code 4), and enter the following lines:

```
100 FOR J=VAL "1" TO LEN A$ STEP VAL "2
110 PLOT CODE A$(J),CODE A$(VAL "J+1")
120 NEXT J
```

Depending upon the program, you may need to delete the rest of the lines. If not, add *130 Stop*. Put the computer into *Slow* mode and *Goto* 1.

For the 1K program only, try changing line 100 to:

```
100 FOR J=VAL "1  TO LEN A$  ■
```



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Developing addresses

***Tim Crispin** provides a simple method of Peeking and Poking to the screen display.*

I read *Popular Computing Weekly* regularly and was very interested in the article explaining how to *Peek* and *Poke* the ZX Spectrum screen (January 6, page 24). However, I feel that the routine developed to give the address was too complex and should not have required the machine code routines mentioned. In fact, a very simple line of Basic will give the address of any character position on the screen from the line and column numbers, see Program one.

The program ■ simplified by considering the screen address to be composed from two bytes — a high and low one ■ be exact. The high byte has the form: *010 aa bbb (Bit 6 is set ie 2↑6=64)*. The bits '*aa*' represent the block of eight lines needed on the screen and can be determined from the line number. If *Line* is the variable used, the byte ■ given by: *High = 64 |←From Bit 6| + 8* Int(Line/8) |←aa| + Cpl |bbb|*. I have called the bits '*bbb Cpl* as these are the Character Pixel Line number.

The low byte has the form: *ccc ddddd (ie two binary parts)*. The bits '*ccc*' form the line required within a block ■ lines. This ■ simply the fraction left when '*aa*' was found, eg *Line=9* has *aa=Int(9/8)=Int(1⅛)*, so *ccc = 8* times the fraction. The bits *ddddd* form the column number which is given the name *Col*. Thus, the byte ■ found from: *Low = 32*8*(Line/8 – Int (Line/8)) |←ccc| + Col |←ddddd|*.

The screen address can now be found from: *Addr = High*256 + Low*. So, *Addr = (64+8*Int(Line/8)+Cpl)*256 + (Line/8–Int(Line/8))*256+Col*. This simplifies to: *Addr = (64 + 7*Int(Line/8) + Line/8 + Cpl)*256 + Col*, which ■ line 40 ■ program one.

To see what *Cpl* means, the following line should be added to program one: *30 Input "Cpl ";Cpl*. Running the program and entering the values shown below is the best way of explaining *Cpl*:

LINE	1	1	1	1	1	1	.
COL	0	1	2	3	4	5	
CPL	0	1	2	3	4	5	.

However, there ■ no need to calculate *Cpl* manually. It is possible to use a *Y* co-ordinate to represent the position and determine *Line* and *Cpl*. After program one as shown:

■ INPUT "■";Y:LET LINE = INT ((175-Y)/8)
30 LET CPL = 8*((175 – Y)/8 – LINE)

This works because *Y/8 = Line + ⅛*Cpl*. The *(175– Y)* is needed as *Print At* 0,0 is at the top left whereas *Y* is taken from the bottom left.

The equation can be simplified so that the variable *Cpl* ■ not used, see program two. Line two is ■ subroutine that gives the screen address ■ any position defined by a *Y* co-ordinate and column number *Col*.

The ZX Spectrum being used at Sutton Primary School, Cambridgeshire

The program executes ■ very simple scroll of ■ graphics "*A*" upwards at a pixel resolution. However, the subroutine at line two could easily be used for more complex screen effects.

Lastly, I have shown how the screen address can be found using machine code, see program three. The routine ■ very simple and can be loaded to any address using any hex loader. The subroutine converts the line/column values held in the *BC* register pair into ■ screen address held in the *HL* register pair. This always has *Cpl=0*, though register *H* now controls the value of *Cpl*. By this I mean that the value of *Cpl* merely has to be added to register *H* to obtain the screen address. This explains the strange memory arrangement used for the Spectrum's screen, for it is very easy to print characters using this arrangement, as can be seen in program four. ■

Program 1

```
 1 LET CPL = 0: BORDER 6
10 INPUT "LINE ";LINE
20 INPUT "COL ";COL
40 LET ADDR = 16384+2048*CPL+32*INT(LINE/8)+LINE
   *32+COL
50 POKE ADDR,255: GOTO 10
```

Program 2

```
 1 LET COL = 0: GOTO 10
 2 LET LINE = INT ((175-Y)/8): LET ADDR
   =(239+7*INT LINE -63*LINE -Y)*256 + COL
   RETURN
10 FOR N=0 TO 100
20 FOR J=0 TO 7: LET Y=N+J
30 GOSUB 2:POKE ADDR,PEEK( USR "A"+J)
   NEXT J
40 LET Y=N-8: GOSUB 2: POKE ADDR,0:REM
   Blank last position
50 NEXT N
```

Program 3

```
78          ADDR    LD A,B
E6 18               AND 18          ;isolate bits 3&4 from the line number
C6 40               ADD A,40        ;makes bit 6 equal 1
67                  LD H,A          ;this is the HIGH byte
78                  LD A,B
E6 07               AND 07          ;obtains 'ccc' from line number
0F 0F 0F            RRCA RRCA RRCA  ;moves 'ccc' into correct part of byte
81                  ADD A,C         ;add the column number
6F                  LD L,A          ;this is the LOW byte
C9                  RET
```

Program 4

```
0E 1E       START   LD C,1E         ;column 30
2A 5C7B     LOOP1:  LD HL,(UDG)     ;address of the character set
EB                  EX DE,HL
06 15               LD B,15         ;line 21
CD ????     LOOP2   CALL ADDR       ;find the screen address
C5                  PUSH BC         ;save line column values
06 08               LD B,08         ;characters are 8 bytes long
1A          LOOP3:  LD A,(HL)       ;byte defining shape of character
77                  LD (HL),A       ;put byte on screen
24 13               INC H:INC DE    ;move pointers to next byte
10 FA               DJNZ LOOP3
C1                  POP BC
10 F0               DJNZ LOOP2      ;change the line number
0D                  DEC C           ;change the column number
20 E8               JRNZ LOOP1
C9                  RET
```

Dictionary

MODULE 5: *Lines 6000-6360*
This is our standard data file handling module expanded to take account of the fact that we now wish to load or save four different sets of data — individual characters from tape, character sets to tape, the dictionary from tape and the dictionary to tape.

Commentary
6070-6140 This section saves the current character set to tape, together with the variable CI, which indicates how many characters it contains.
6150-6200 This section loads a single character from tape and stores it in the dictionary.
6210-6270 This section stores the current dictionary on to tape.
6280-6340 This section loads a dictionary from tape. Note that a new dictionary can be loaded during the creation of a character set, thus allowing the character set to draw upon a wider range of characters than can be contained within one dictionary.

Testing
You should now be able to pick up characters created by the previous program, compile them into a dictionary or dictionaries and, using these dictionaries compile your own character sets and save them on tape. If these functions are all available, the program is correctly entered and ready for use.
DICTIONARY: *Summary of single key functions:*
With flashing cursor:
Left and right arrows move cursor.
Up and down arrows move display to new page of dictionary.
"D" — deletes character above cursor from dictionary.
"C" — adds character above cursor to current character set.
"Q" — returns control to menu.
No flashing cursor (character set display):
"D" — deletes current character set.
Any other key returns to menu.

SUMMARY

This is an uncomplicated program for the simple reason that it is designed to leave the maximum amount of space for the strings containing the actual characters themselves. Once entered you are ready to embark on the task of creating and compiling sets of characters for use in high resolution mode. As previously mentioned, later programs will take you further by showing practical ways to use such character sets without having to specify the *Drawing* of each character separately.

GOING FURTHER

(1) As with the character creator itself, this program will only come into its own when you get around to compiling a dictionary or two.
(2) Text is not the only area where the programmer might benefit from having a set of "characters" available in high resolution modes. What about developing sets of symbols for electronic diagrams, for instance. Remember that, using the *Draw* command such symbols can be rotated, so that a single symbol is ■ that will be necessary for each component, no matter what its orientation may be. You could, perhaps, add the ability to *Draw* such characters to ■ program such as 'Designer' thus allowing symbols and text to be made an integral part of the designs created using that program. ■

```
6000 REM************************
6010 REM DATA FILES
6020 REM************************
6030 MOTOR ON:AUDIO ON:CLS:INPUT "POSITION TAPE THEN PRESS enter  (MOTOR IS ON)
";Q$
6040 MOTOR OFF:INPUT "PLACE RECORDER INTO CORRECT MODETHEN PRESS enter";Q$
6050 PRINT:PRINT "FUNCTIONS AVAILABLE.","1)SAVE CHARACTER SET","2)LOAD NEW CHARA
CTER","3)SAVE DICTIONARY","4)LOAD DICTIONARY":INPUT "WHICH DO YOU REQUIRE:";Q:ON
 Q GOTO 6070,6150,6210,6280
6060 RETURN
6070 MOTOR ON:FOR I=1 TO 10000:NEXT
6080 OPEN "O",£-1,"CHARSET"
6090 PRINT £-1,CI
6100 FOR I=0 TO CI-1
6110 PRINT £-1,CHAR$(I)
6120 NEXT I
6130 CLOSE £-1
6140 RETURN
6150 IF DI=100 THEN RETURN
6160 OPEN "I",£-1,"CHAR"
6170 INPUT £-1,D$
6180 CLOSE£-1
6190 LET DI$(DI)=D$:LET DI=DI+1
6200 RETURN
6210 MOTOR ON:FOR I=1 TO 10000 NEXT I:OPEN "O",£-1,"DICT"
6220 PRINT £-1,DI
6230 FOR I=0 TO DI-1
6240 PRINT £-1,DI$(I)
6250 NEXT I
6260 CLOSE £-1
6270 RETURN
6280 OPEN "I",£-1,"DICT"
6290 INPUT £-1,DI
6300 FOR I=0 TO DI-1
6310 INPUT £-1,DI$(I)
6320 NEXT I
6330 CLOSE £-1
6340 GOTO 1000
6350 LET D$="BM+1,+0;R0;":FOR H=0 TO 2:LET E$="":FOR I=0 TO 13:LET E$=E$+D$:LET
DI$(H*14+I)=E$:NEXT I:NEXT H:LET DI=40
6360 RETURN
```

Breathing fire

Keith and Steven Brain *explain how you can write your own Dragon games.*

Although some superb games software is now available for the Dragon 32, half the fun of having your own computer is being able to design and write your own original games programs. However, even when you have read through the manual and understood the Basic commands themselves, you must still learn how to link these together to build up useful and sophisticated programs.

Let's start with something simple — and what could be simpler than a reaction tester to see how fast you can respond to seeing a character appear on the screen. Remember that many action games are based on quick and accurate responses.

```
10 CLS (clear screen)
20 A=RND(500) (choose random no 1-500)
30 A=A-1 (decrease this by 1)
40 IF A>0 THEN 30 (if A not 0 then go back)
70 TIMER =0 (start timer)
80 PRINT "*" (print a star)
100 A$=INKEY$ (check if any key pressed)
110 IF A$="" THEN 100 (if no key pressed recheck)
150 PRINT TIMER (print reaction time)
160 GOTO 20 (start again)
```

Well that's OK as far as it goes, but it soon becomes easy, as the star always appears in a predictable position on the screen. Why not add to the difficulty by moving the position of the star around the screen at random? There are 512 print positions (0-511), so simply change the program by adding:

```
50 B=RND(512)-1 (choose random no 0-511)
60 PRINT @ B,"*" (print star at that position)
```

That prints the star at random, but the reaction time display also jumps around unless we add:

```
150 PRINT @ 0,TIMER (print time in top LH corner)
```

This makes things look neater but, as the screen fills, your reaction time increases as you cannot tell the latest star from the old ones. There are two solutions to this — we can make a noise as each star is born, and we can clear the screen after each go:

```
80 PRINT @ B,"*" : SOUND255,1 (print star then make noise)
140 CLS (clear screen)
```

Note that we clear the screen just *before* the time is printed, otherwise the time display will never be seen.

Even that modification does not take too much getting used to, so let's bring in a bit more skill by printing a *1* or a *2* and saying that you must only press a key if a *2* appears. In the first example, with the star, there was only one correct action (press any key) — but now things are more complicated. To be right you *must* press a key if a *2* appears, but you *must not* press a key if a *1* appears:

DISPLAY	KEY PRESSED?	
2	yes	RIGHT
2	no	WRONG
1	yes	WRONG
1	no	RIGHT

But, if no key at all is pressed, the program will loop back from 110 to 100 for all eternity! We can resolve this problem by putting a *For-Next* loop of fixed length around the *Inkey$* check. This sends you back to the start without a time print if you run out of time or if you press a key when a *1* is displayed:

```
70 C=RND(2) (choose 1 or 2 at random)
80 PRINT @ B,C; SOUND 255,1 (print number chosen)
90 FOR N=1TO500 (check if any key pressed 500 times)
110 IF A$="" THEN NEXT GOTO 10 (if no key pressed recheck — if checked 500 times then go back to start)
120 IF C=1 then 10 (if a key was pressed and a 1 was displayed go straight back to start)
```

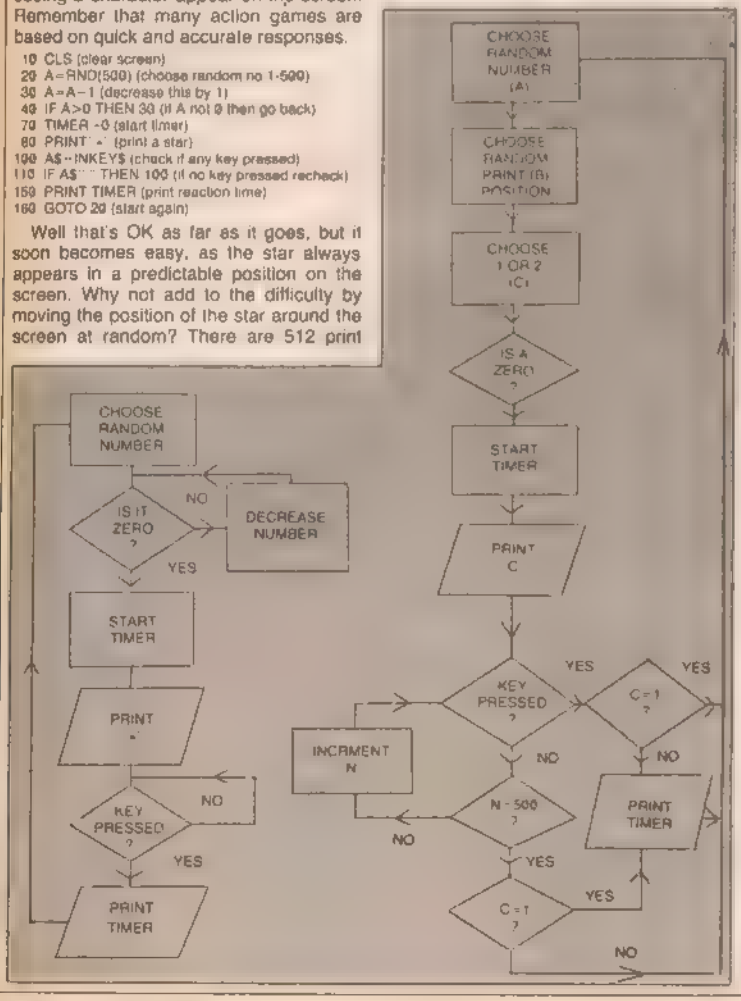
To make sure you notice your errors add some raspberries and success notes:

```
110 IFA$="" THEN NEXT : IFC=2 THEN SOUND 15,10 : GOTO 10 : ELSE SOUND 150,5:GOTO 10 (if no key pressed recheck until time up. If time up and 2 displayed but no key pressed sound raspberry. If time up and 2 not displayed signal success)
120 IF C=1 THEN SOUND1,10:GOTO 10 (if key pressed before time up and 1 displayed sound raspberry)
130 SOUND200,5:PRINT TIMER (sound success, only reached if key pressed before time up and 2 displayed)
```

Life would be even simpler if the computer kept score for us. So, let's add three new variables *D*, *E* and *F*, increment them for failures, successes and tries respectively, and print the status at the top of the screen after each try. Note that careful planning is needed to squeeze the whole status display on the top line and the random display is now limited to the rest of the screen.

```
20 A=RND(500):PRINT @ 8,"TRY";F;"RIGHT";E;"WRONG";D:F=F+1
50 B=RND(480)+32
110 IFA$="" "THEN NEXT:IFC=2THEN SOUND15,10:D=D+1:GOTO 10:ELSE SOUND150,5:E=E+1:GOTO 10
120 IF C=1 THEN SOUND1,10:D=D+1:GOTO10
130 SOUND200,5:E=E+1:PRINT @ 0,"TIME";TIMER
```

Keith (left) and Steven Brain.



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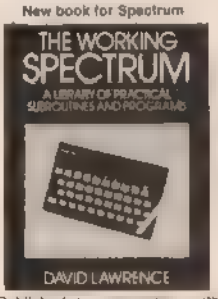

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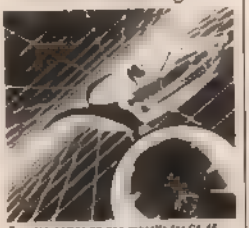

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50 FRENCH VERBS IN 5 TENSES for 48K Spectrum. Test yourself at random in the tense of your choice or enter tense and infinitive and all forms of the verb will be displayed. Excellent for reference, learning and testing. Highly endorsed by leading language teachers. £3.95. W Thues, 25 Primula Drive, Norwich, Norfolk.

SWAP YOUR UNWANTED SOFTWARE via Software Exchange Club. SAE for details. UKSEC, 15 Tunwell Greave, Sheffield S5 9GB.

PERSONAL COMPUTERS bought for cash. Morgan Camera Co, 160 Tottenham Court Road, London W1. Tel. 01-388 2562.

ACE INVADERS. A program in Forth for the Jupiter Ace. Fast action, full graphics and sound. Listing £1 or cassette £1.50 including p&p. Forth Dimension, 32 Balhurst, Orton Goldhay, Peterborough.

DUST COVERS available for any computer, printer, etc. BBC, TI, Epson, £3.95; Dragon, Atari, Vic20, £2.95; Sharp MZ-80A-K, £4.95. For others please phone or write to Sherborne Designs, Victory House, 8A The Rank, North Bradley, Trowbridge, Wilts. Tel: 02214 4425. Also made-to-measure service. Dealer enquiries welcome. Access and Barclaycard.

ALL MICRO OWNERS. Filter your power supply, and avoid glitches. Filter fitted in two minutes. Complete with instructions, £4.50. M Lamb, 6 Park Street, Scarborough.

SPECTRUM GRAPH PLOTTER. Draws pie-charts, bar-charts, line plots and scatter diagrams. Fits 16K Tape ■ five routines and five demonstrations, including instructions, for £5, or SAE for details. TopGraph Software, 106 Blundell Road, Luton, Bedfordshire LU3 1SP.

MONSTER MAZE cassette for 16K Sinclair ZX81, £2.99. Cheques to B McCulloch Software, Freepost, Wellingborough, Northants NN9 7BR.

CIBACHROME PHOTOGRAPHIC COLOUR PRINTING CONTROL PROGRAM for Spectrum 48K, exposure and filtration calculated, exposure and process timings, adaptable to other processes. SAE details. Derek Longe, Manor Close, High Street, Thornborough, Bucks MK18 2DF.

ASTROLOGICAL CHARTS with aspects drawn in high resolution on Spectrum 48K, hard copy on to printer. SAE details: Derek Longe, Manor Close, High Street, Thornborough, Bucks MK18 2DF.

BBC MODEL A, 32K, 4 VIA cassette, leads, books, software. As new, £325. Tel: Tunbridge Wells 34117.

WANTED. Good software and add-ons ZX81 Spectrum. Please reply to: Micro 81, PO Box 800-75 Auckland 7, New Zealand.

ZX81 16K roulette program, for one to four players. Can you break the bank? + free fruit machine program. £2.45. Cheque/PO to Mr A J Hartley, The Old House, Wolseley Bridge, Stafford, ST17 0XJ.

BATTLE 4 out on the BBC! Trek, Gobbler, Battle of Britain! All on one cassette, for only £4 (+ 50p p&p). James Keane, 14 Roundcroft, Cheshunt, Herts.

SHARP Business System, C.P.M. £25, Word Star £40, Spell Star £40, Mail Merge £25, Pay Roll £50, Sales Ledger £40, Manuals £10. Computer disc drive and printer, £1,500. Tel: 0783 220224 after 6 pm.

BBC DRAGON SPECTRUM software, quality software at lowest prices. SAE to Flipside Software, 11 Barnfield Road, Hyde, Cheshire SK14 4EL.

JUPITER ACE SOFTWARE available now. Four quality games on cassette for only £4 including p&p. Cheque/PO payable to Voyager Software, 9 Burton Drive, Wrexham, Clwyd LL12 8BG. SAE for catalogue.

VIC20 plus cassette deck, as new, £150. Phone 01-809 3365.

SPECTRUM "SNIFFER". Reads tapes and prints out program name, length in bytes and start address. Machine code and basic! Also gives auto run line number. £2.50. From AWA, 50 Dundonald Road, Dudsbury, Manchester.

SPECTRUM (16/48K). Multi-purpose filing system menu driven, easy to use. Features alphabetic sort, numeric totalling, selective searching, cassette storage and retrieval. £7.50 (or SAE for details) to: J. R. Briggs, 33 Wessex Gardens, London NW11 9RS.

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Free readers entries to buy or sell a computer. Ring 01-930 3266 and give us the details.

Spectrums for sale

SPECTRUM 16K with original packaging, one month old. Perfect condition. Kempston joystick + two new books, £135 or would separate. Tel: 0255 429984.

ZX SPECTRUM, 48K, printer, 10 rolls, £200 of software, £220 ono. Tel: Slough 77101.

48K SPECTRUM, as new + printer (ZX), £180. Tel: 0222 860897.

ZX SPECTRUM 16K plus £35-worth of magazines for £100. Tel: West Drayton 44875 evenings.

SPECTRUM, 48K, five months old, good condition, plenty of good software, £180. Tel: Basildon 42621, evenings only.

SPECTRUM, 48K, brand new, all leads, manual and original packing plus eight games, £165 ono. Tel: David (054) 681 279 after 5 pm.

ZX SPECTRUM 16K and leads, manuals, games tapes, £115. Tel: 0279 31120.

16K SPECTRUM about £80 of software, leads, etc. £130. Ring 573 6442 (after 4 pm).

ZX SPECTRUM 16K, 4 months old + demo tape and game tapes, £110 ono. Tel: Birmingham 5542282.

16K SPECTRUM — one of the first out — works perfectly, still boxed with leads, power pack, manuals and two books, eight cassettes including Spectral Invaders, Scramble, games pack 3. £120. Jonathan Cannell. Tel: 01-554 6389/553 3128.

48K SPECTRUM, as new, £150. Tel: 01-445 8369.

ZX81s for sale

ZX81, 16K, £50 ■ software, including Asteroids, B.O., Scramble, Castle of Adventure and Gulp. Manual, leads, magazines. Guarantee until July. £70 ono. Castle Combe (0429) 782716 (after 5 pm).

ZX81 16K compatible cassette recorder, proper keyboard, over £50 of software + books, lots of magazines. Worth £200, will accept £100 ono. Ring Oxford 55886 (from 6 pm).

ZX81 16K + £30 of software, £65. Ring 061-928 8032 (after 4 pm).

ZX81, 16K Ram, DK Tronics graphic Rom, keyboard, software worth £180, yours for £85 ono. Tel: Maldon 891871.

ZX81, 16K, + 6 books + listings, manual, leads etc + 30 software cassettes £60. Tel: Harpenden 2007.

ZX81 16K and £30 of software including ■ Gauntlet and Avenger, £55. Tel: 01-761 1317 after 4 pm.

16K ZX81, perfect condition, 4 cassettes, leads and listings, £65. Tel: Chesham (Bucks) 785285 after 5 pm.

ZX81 16K, £50. Tel: Edenbridge 863525. Philip O'Brien.

ZX81 16K, 14 pre-recorded cassettes, arcade games, books, magazines + power pack with leads. Buyer collects, £90 ono. Tel: 01-859 2483 (after 6 pm).

ZX81, still under guarantee, 16K + six games tapes + magazines + book + Star Chess TV game, £100 ono. Tel: Orpington 73653.

ZX81 1K, little used. Boxed, two cassettes (26 games), eight magazines, games book. Very good condition, £49 ono. Tel: Andrew, 01-435 3237 after 5 pm.

ZX81, 16K. All Sinclair built-in DK Tronics keyboard + numeric pad, leads, manual, £100 software; £110. Tel: Maidenhead (0628) 29099 after 4.30 pm.

ZX81 + 16K, Sinclair-built + all manuals + leads + Focram loading aid + software £60. Tel: 01-310 7356.

ZX81, unexpanded, £35. Tel: Ashford 50188.

16K ZX81, the Kh1K keyboard, cassette deck, 5 good games tapes, magazines, a book, all leads + mains adaptor. £85 ono. Tel: Thetford 4216.

ZX81 + 16K + good s/w. £65. Tel: Watford 30218.

ZX81, 16K, with mikrogen joystick, QS graphics and sound boards, with motherboard and 31 software cassettes, £110 ono. Tel: 01-959 5964 after 5 pm.

ZX81 + 16K with 16 tapes including Flight Simulation, Asteroids and 3D Defender + computer training module, assorted software £90. Tel: 01-699 7761 after 5 pm.

ZX81 16K, leads + manuals, £65. Tel: Pelshall 682251. (W. Midlands)

ZX81 16K, manual, leads, software, several games, very good condition, £55 ono. Tel: 051-644 7312 (6 pm).

ZX81, 16K + two books and two tapes, £55. Tel: Cumbernauld 23727.

ZX81 16K + Forth swap for Vic 101 or similar. Tel. Brighton 685186.

ZX81, 16K, DK'tronics keyboard plus numeric pad and several cassettes, programs, books and leads inclusive, £110 ono. Tel: 0685 714 04.

ZX81 16K + leads, manual, lots of software, books, £70 or reasonable swap Tel: 01-894 4144 John.

ZX81, 16K, sound box, printer, ZX psu, worth £185, £125 ono. Tel: Bridlington 72471.

16K ZX81, + keyboard, worth £110, sell £75. Software also available if required Tel Chesham 772544.

ZX81 Sinclair-built, plus 16K RAM plus £40 of software, including Asteroids, Space Invaders, Pacman, plus magazines, £75 ono. 023 582 7129 (Sutton Courtney).

SINCLAIR ZX81 plus Memotech 16K, Mazogs, Flight Simulation and others, £65 ono. Plus ZX81 1K and games, £40 ono. Tel 01-654 6722 after 6 pm

ZX81, 16K Ram Pack + two cassettes. Offers. Tel: (01) 699-5909. Mrs Wallace

ZX81, 16K £50. Tel: Coventry (0203) 69166

ZX81 16K + briefcase + Ferguson cassette + software including Ad. One, Kingdom of Nam, Dallas, Breakout, Backgammon, Volcanic Dungeon, 3D Defender, Phoenix, Startrek, etc Best offers Tel: 01-947 0454.

ZX81, 1K, cassettes, games, mags £30 ono. Tel: 01-961 2855 ■ pm)

16K ZX81 plus 16K Ram plus ribbon cable, plus Kayde keyboard, £40 of software, new £180, now £95 Tel: 0873 2107

ZX81, 16K, software and listings. £50 ono. Tel: Rossendale (0706) 227672 (5 pm).

ZX81, 16K plus cassettes and books. £55 ono. Tel 0786 70346.

ZX81 + 16K Ram, hardly used. Lots of software, manuals, "Sinclair Users" and "Sinclair programs", £60 ono Tel: Teversham, Cambridge (02205) 4336 evenings.

ZX81, 16K, manual, m/c book, ass, dis, compiler, debugger + software, £65 ono. Tel: Barnsley 722353 (6 pm).

16K ZX81, D'ktronics 4K graphic Rom, Fuller FD, 42 key keyboard + bleeper module £160. Tel: Crawley 30425.

UNEXPANDED ZX81, 8 months guarantee £20. Tel. Tilbury 4692 after 4 pm

16K ZX81 with 11 magazines, three books, manual, five professional tapes, tape leads and it rarely crashes. £65 (Wednesday to Friday, 5 pm to 7 pm) 070-541 2755.

ZX81 + **32K,** Ram. £60; ZX Printer + paper. £38. Telephone Uxbridge 58539 evenings

ZX81, 16K, including Bi-Pac sound box and input/output board with £30 worth of software. Will sell for £50 ono. Tel: 01-789 8883 evenings.

ZX81 plus 16K Ram pack, all leads and manuals and two games tapes £65. Tel: Ampthill (Beds) 0525 402008 after 3.30 pm.

ZX81, 16K, cassettes of software + magazines, £55 ono Telephone Weybridge 55751

8K ZX81, Sinclair built, with leads, manual, PSU + tapes, £35. Telephone 01-399 5835 (5 pm-9 pm evenings).

ZX81 16K RAM. 8K graphics, Eprom and software and box, £100. Tel: 061-681 2134.

ZX81, 16K, **DK'tronics cased** keyboard, plus QSave and other tapes, £100 ono. Tel: Mr Keeler on (Horsham) 0403 56718 evenings.

ZX81, 16K Rampack complete with leads, manual and tapes. £40 Tel: 01-421 0232.

ZX81 16K, interface board + three tapes, £70 ono Tel: 01-882 0687.

16K ZX81, with software, £50. Telephone 01-542 8455.

ZX81, 64K. Nine months old. Sinclair built, as new, still under guarantee. full size Crofton (C) board, tape recorder, printer paper, manual, adapter magazines, books + many games. £140 ono. Tel: 01-228 3546

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ZX81 16K DEAN KEYBOARD + case, tape deck, manual, leads, over £100 of popular software, books, magazines, cost £25, offers? Tel: Rayleigh (0268) 779645

ZX81 1K with power supply, all leads and one manual and one book, 2 months guarantee left, £30 Tel Brookwood 81102

ZX81 1K + manual, leads + 60 programs in good condition, under guarantee, £37 Telephone Watford 20583

ZX81, 16K + typewriter keyboard + case, 4K graphics Rom, software including Pacman, Galaxians, lots of mags and books, £90. Tel: 061 432 4358

ZX81, 16K Ram, lead, manual, etc Under guarantee. £55 ono Tel: Tonypandy (0443) 431742

ZX81 16K MEMOTECH Ram pack, unwanted, £25 Tel. 0851 5239

ZX81 16K UNUSED PRINTER. Manual, leads, software and magazines Offers over £100 Tel. (Leamington Spa) 313 747

ZX81, 16K, all leads, power pack, in original box, magazines and optional software, still under guarantee. £60 Leeds (0532) 677898 (evenings)

ZX81, 16K, 4K graphic Rom, sound box, cassette, £130 ono. Tel: Richard, Shoreham-by-Sea 3425.

ZX81 with large keyboard, about 20 programs, £20. Tel: 061-681 2875.

Commodores for sale

VIC20, cassette, manuals, several issues of Vic computing 3 slot motherboard, 8K Ram expansion with battery back-up, machine code monitor cartridge, joystick, books on Basic and machine code programming, over £300 worth of software including Sargon II, Chess, Jelly Monsters, Super Lander. The whole lot is worth over £650 will sell for £400 ono. Ask for Terry Wilson, phone Preston (0772) 863638.

VIC 20 + cassette unit, 3K super expander, joystick, perspex dust cover, Vic Revealed + lots of software, as new, £180 Tel. Middlesbrough 593709 after 5 pm.

VIC20 plus 3K Ram pack, joystick and cassette unit, software including Centipede, Scramble and Omega Race, plus books, £200. Tel. Stephen on (Leeds) 0532 782349 after 4 pm

VIC20, cassette recorder, 3K super expander cartridge, joystick, PacMan cartridge, £60 of cassette software, two books, £250. Tel: 01-866 5135 evenings.

VIC20 + cassette with 3K super expander and 8K motherboard. The Count, Radar Ratrace, Mastermind, Intro to Basic 1, Vic revealed and other books + lots of software, under guarantee and boxed, £250. Phone 952 4397.

PET 32K, £450 + Computer, Chess, Defender etc + manuals Tel: 01-727 9209 after 6 pm.

VIC20, cassette unit + joystick, as new £40 Tel: Uxbridge 52641

VIC20 + 16K + 3K cartridge cassette unit joystick, covers, £140 software, £20 books, - £220 ono Tel 021-440 5280 after 6 pm

VIC20. Cassette deck, super expander, joystick + video extension lead, £170 Tel. Widnes 5668.

VIC20 + cassette unit, 8K Ram and games + manual £140 Tel 01-527 8881

VIC20 + cassette recorder, 16K + 3K expansion units, two cartridge games Much cassette software + books, magazines Still under guarantee, worth over £400, only £189 Tel: 01-741 3361 evenings.

VIC 20 CASSETTE DECK. £175 of cartridges including super expander, Omega Race, Jellymonsters, Pirate code etc, any offer over £280 Telephone 09016 634 (4 45-6 00 pm only)

VIC20 + cassette unit, + books, + mags, 16K, £100 Progs + other, all any offer Tel 0606 75119

VIC20 + 16K cassette deck, super expander, joystick, £150 + software, Introduction to Basic 1 and 2 £299 Tel. 0424 216414

VIC20 16K + cassette unit, joystick, covers 'O' level cassettes £100 software £230 ono Tel 021-458 7682.

VIC20 + CTN unit + super expander, Star Battle Loads of software, magazines + Vic Revealed, £250 Tel: Chorley 64461

VIC 20 + 3K data cassette, joystick, super expander Advengures, Ratrace, Star Battle, Omega + 10 cassettes + mags £300 Tel Talsfield 656.

COMMODORE PET 3032 with 2 disc drives and Commodore printer 18 months old £1,500 Tel Maidenhead (0628) 31961 evenings and weekends

VIC20, cassette deck, lots of magazines, books and software for £150 Write only to Sid Akhtar, 1 Edward Street, Werneth, Oldham, Lancs OL9 7QW Tel. 061-633 4887.

VIC20 + cassette, light pen, 32K Various software, £200 Tel: 01-789 6183.

VIC20 plus cassette unit, plus 8K motherboard plus 3K super expander, Forth Rom Gort Omega base, Saigon II, Chess and Star Battle cartridges, one joystick various books and tapes £250 ono. Tel. Dunfermline (0383) 734731 evenings

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16K VIC20 + cassette disc drive + Joystick, software including Program Aid, Super Expander, Sargon Chess + program ref. guide Worth £650, sell for £400 ono. Tel: Shoeburyness 3984.

VIC20 CASSETTE UNIT. Joysticks, all boxed. TV set (b/w) Games, application, manual, magazines, £249 ono or for MZ80K Tel: Colne 866386.

VIC20, + cassette deck, 3K high res. cartridge, Jelly Monsters, Space Battle, Joystick, £185 ono Tel: 01-398 7033/1199, Mr Bredge

VIC20 + cassette + four games + chess program. Learn basic + reference manual, £165. Tel: 061-434 8483.

VIC 20, cassette deck, 3K super expander, high res cartridge, joystick + £70 software, perfect condition, £190 Telephone Simon, Otton (0420) 86395.

COMMODORE VIC20. 8K, 3K super expander, machine monitor + 20 games, good condition, will separate Phone Norwich (0603) 712320 (5 pm).

VIC20 plus cassette unit, 8K expansion, Intro to Basic Part I, programs + magazines, still under guarantee, £195 Tel: 0993 844437.

VIC20 + cassette + joystick, introduction to Basic Parts 1 and 2 Progs Reference Guide, three months old. £140 Tel: 01-908 4911

VIC20, cassette deck, joystick, 16K Ram, few programs £220 ono. Tel: Dublin 01-723 5816 Ask for Mr Tyson.

VIC 20 + cassette unit, Alton expansion, 27K extra Ram, £75 books, £125 cartridges, £100 cassettes, as new Sell for £525 (complete). Tel: 01-942 6324

CBM PET 2001. 16K, new Rom, Cassette unit, program sounds generator, toolkit, manuals, software, good condition, £250 ono. Tel: Leek (0538) 385900

COMMODORE PET 4032 (upgraded 3032) including 2 Rom sets, cassette, books, light pen, reset switch, (software tape or disc), £375. Tel: 0302 383212, 0793 830248

32K PET, 3K Rom, disco pro chip, cassette player. Tel: 01-398 6963 (after 6.30 pm)

PET 3032 + 3040 dual disc unit (April '82) £975. Tel: Keith, Camberley (0276) 61484.

VIC20 with C2N cassette deck, 3K super expander, joysticks, Star Battle cartridge, Vic Revealed, lots of software, £150. Tel: Coalville 38611.

VIC20 cassette deck, Jelly Monsters, 8K Ram, joystick, Superworm, Hopper, Alien Blitz, Amok, Mars Invaders, Ant Raiders, Another Vic in the Wall, Asteroids + 46 other games, worth £330. Offers Tel: Great Dunmow 810720.

VIC20 + C2N cassette deck, integer basic part 1, £50 software, £160 ono. Tel: Ickford 867.

VIC20 plus 16K with cassette unit, Introduction to Basic 1 & 2, various games, all less than 3 months old, £220 ono Tel: Sheffield (0742) 662155 evenings.

VIC20 + data cassette, 8K Ram, joystick + lots of cassette games, £140 ono Tel. 01-948 3916 Andy.

VIC20 + cassette unit + joystick, Duplicated Prison, all boxed as new, £150. Tel: Evenings Hornchurch, Essex 44238 after 6 pm.

VIC 20 + cassette unit with 8K Ram, super expander, cartridges including Omega Race and Star Battle — also 10 cassette programs including Defender, Traxx and Frogger. Two months old, cost £360. Sell for £260 ono. Tel: 01-574 4122 after 4 pm.

VIC20 + cassette and 4-month guarantee, super expanded. Jelly Monster, Sargon Chess. Joystick + £30 software. Programme reference guide + more books, £170 ono. Tel: 0532-524657.

VIC20, plus 16K expansion, high res. tool kit, data set and £70 software. Will swap for BBC micro. Tel: 021-704 3915.

VIC20 with cassette deck, super expander, Alien, Voodoo Castle and Blitz. £180 ono. Tel: Spennymoor 817304, after 4.30 pm

VIC20 + cassette, super expander, Jelly monsters, Lunar Lander, games and tapes, magazines, ▒▒ boxed, under guarantee £180 ono. Tel: 0384 75387

VIC20 + cassette deck + super expander 8K Ram. Sargon II Program Reserve Guide, Intro to Basic Part I, etc., £200. Tel: 041-948 6868.

VIC20 + cassette unit + 16K Ram + super expander + m/c monitor + Vic Revealed + programmers reference guide + light pen + £100 of software, 4 months old £350. Tel: Irving 213303 6-9 pm.

COMMODORE PET 32K, basic four toolkit, reset switch, cassette deck and cassettes + manuals, £375 ono. Tel: ▒1-748 9064 evenings.

19½K VIC20 cassette recorder, Adventure Rom, joystick, 32 programs, £200. Tel: Crawley 272434.

COMMODORE 8K, small keyboard integral cassette, £125 ono + small Trendcom Thermal Printer, 40 cols, £50 or £150 for both. Tel: 01-748 9064 evenings.

VIC20, four months old, complete with cassette unit, joystick, 8K Ram, Advent cartridge, Rat Race and other cassettes, software, free Vic Revealed, only £175. Tel: 01-272 3319 after 7 pm.

VIC20, 32K Ram on storeboard + Vickit II + Rom motherboard Advengers, Adventureland, Sargon II, Chess. Joystick, covers all fitted + eight Vic Books, £660 value, sell £375. Tel Kendal 28573.

VIC20 CTN cassette recorder + 16K ext Ram, 3K MRS expander + books + much software. £225 ono. Tel: 0653 87678.

VIC20 £60. Sargon II chess, Adventure Land + Omega £15 each. Tel: Colnbrook 3984.

VIC20, brand new, 12 month guarantee, super expander cartridge, Vic program guide, joystick, cassette and various magazines £150. Tel: G. Johnson (after 4.30 pm).

21K VIC20, with 1515 graphic printer, paper, 2CN cassette recorder, 13 games and utility cartridge + game tapes, with paddles All worth £867, will accept £520 ono. Tel: Peter, Erith 32102.

VIC20 + cassette player + £50 software New at Christmas, £175 ono. Tel: Macclesfield 21574

VIC20, will swap Pirate Cove for Mission Impossible. Tel: 0242 75795.

VIC20 + 3K + £21 worth books, £125 or exchange for Olympus OM2N camera. Write J. E. Kelly, 14 Hibbert Lane, Marple, Cheshire SK6 7NL.

PET 2001, 8K memory, small keyboard + integral cassette, dust cover, books, manual + lots of tapes, £200. Tel: 0670 627615.

Ataris for sale

ATARI VCS, six cartridges, £100 ono Tel: Runcorn (092 85) 60635.

ATARI 400, + 3 games, pair of joysticks, £220 ono. Tel: 01-602 1280 home; work 01-837 4272 extn 120, Mr Lloyd Bailey.

ATARI 400, 16K, complete with 410 cassette recorder, all manuals, loads of games, £300 ono. Telephone Horsham 56954.

ATARI 400 16K. 2 months old, tape recorder, pair of joysticks, basic + hand books + Asstrike, Star Raiders, £220 ono. Tel: M. Shoob, 01-204 9679.

ATARI, VCS, Combat, Space Invaders, Outlaw, Pacman, Video Chess, Asteroids, £100 or swap for Spectrum Tel: Bolton (0204) 62085.

ATARI VIDEO COMPUTER system, with 9 cartridges, £190 Tel: 01-402 8570.

ATARI VIDEO GAME, with Combat etc. Paddles and Mercury joystick. £125. Tel. Belfast 671734, after 5.30 pm

ATARI V.C.S. with seven cartridges, including: Street Racer, Combat, Breakout, Human Cannonball, Asteroids, Adventure and Space Invaders, worth £235, want £110. Ring Andrew on Blackmore (0277) 821458 after 4 pm.

ATARI VCS + five cassettes, £85 or will swap for ZX81 + 16K + money. Tel: 0925 811879.

ATARI VIDEO CONSOLE, six games + set of keyboard controllers, £110. Tel: Southend (0702) 48193.

ATARI 400 + SI Key and IC board + Basic cartridge + manual + Star Raiders + joystick £330. Tel: 01-570 8859

ATARI VCS boxed, with Combat, Joystick and pedals. £70. Tel: Darlington 66130

ATARI 400, 48K + basic, cassette player Starraiders, Crossfire, etc. Best offers to: 01-571 1309, after 7 pm (Kikey)

ATARI VCS, joystick + paddles, two cartridges + rack, £70. Tel: 0344 51839

ATARI VCS, PacMan + Video Chess, Combat, £100 ono Jack Tsouramanis. Tel: 01-348 5668.

ATARI VCS + seven cartridges, including PacMan, Space Invaders and Asteriods. Will swap for Vic20 + cassette deck. Tel: Baltle (04245) 2878.

ATARI 400, 48K, recorder, Basic, manuals, £350 of software, nine cartridges/five tapes, Defender, Star Raiders, Pacman, Galaxians, Joysticks, only £495 ono. Tel: Maidstone 681827.

For sale

BURROUGHS B20 + memory 128, sloppy disc, 1 m'bite, 2 cartridge disc drive, 4.6 m'bite, line printer 300 LPM, fixed drive, 38.5 on 4 platters for VDU. Offers. Tel Mr Fisher 0634-44533, x219.

WILL ANYBODY swap the Arcade-type Spectrum program for my J K Greyes Escape. Ring 0278 663201 Tuesday or Thursday (evenings).

VIDEO GENIE 1 OR 2 with or without monitor, preferably in south-west, but anything considered will offer cash Tel: (0272) 835771.

ZX PRINTER + paper, £49. £50-worth of 16K Spectrum software, sell for £25. Tel: 0709 546587

STAY SHARP with an MZ80K, 48K, with compatible joystick and cassette, 25 games including Golf, Connon Ball Island, Breakout. Free delivery UK mainland, £310 Tel: 0242 602608 (Gloucester) evenings.

UK101 + **610 BRD,** 32K Ram. Two x mini disc drives. Sek cased, 65B V31 dos, link 65, basic 5, Segmon etc, B/W monitor, £450 ono. Tel: Aldershot 26796.

DRAGON 32. Joysticks, 2 months old £195 ono. £67 of software for £50, boxed as new. Mr Hill, Swindon (0793) 770173.

DRAGON 32 Berserk cartridge, swap for Ghost Attack cartridge. Tel: Winchester 0962 54161.

HOW TO PROGRAM ZX81 work book, How to Program ZX81 training manual, How to Program ZX81 cassette £6 Simon Cannell, Tel: 01-554 6389.

ADVENTURE GAME called Mission Asteroids 3.3 disc drive for the Apple II computer, £10. McKenzie. Tel: Pontybodkin (0352) 770233.

15 ROLLS ZX PRINTER PAPER, £23 Tel: Warrington 821899 after 4.30 pm.

VIC20 SOFTWARE for exchange. Philips G7000 cassettes £7.50 each. Tel. 01-387 8751 6 pm to 9 pm

SWAP, Vic20 uper Lander + Avenger Cart for any other Cart (Vic 20). Telephone Bolton (0204) 43094.

5 ROLLS OF SINCLAIR PRINTER PAPER, untouched. £6. Tel St Helens 26314

SHARP PC1212, CE1211, CE122, EA11E power adaptor, manuals etc £70.00 Tel Luton (0582) 593088

SINCLAIR PRINTER PAPER, 10 rolls, only £15 or will sell 5 for £8. Tel: 01-969 8076.

DRAGON 32, hardly used, joysticks, lots of cartridges + tapes, £250 ono. Tel: Newcastle-upon-Tyne (0632) 682406 (evenings).

NASCOM II, 16K, fully cased and working, documentation + tape recorder, £300. Tel: 01-485 4773.

TEXAS T99/4A + extended Basic chan + cassette lead. £160 Tel Slough 46579.

TANDY TRS80 PC1, same as Sharp PC1211, £60 ono. Tel 01-202 3624.

VIC20, cassette unit, £25 Software. £140 Tel. Telford 595194

SWAP Vic20 Adventureland, perfect condition, for the Count of Voodoo Castle Tel: Geoff 061 477 1414 ext 239

PHILIPS G 7000, + 10 cartridges. £100 ono. Tel: 0634 574547

PHILIPS G7000 colour computer with six Videopaks, cost £160 new, unused £95 ono. Tel: Matlock (0629) 56771.

SWAP Scot Evans adventure game for any other adventure game. Tel: Glossop 2674.

TRS-80, III, 48K, 2 disc drives, s/w, 3 months old, £925 ono. Aagley (0562) 883544, West Midlands

TANDY TRS 80-level II, VDU cassette unit, £150 Tel: Sidlesham, Sussex 7394 after 6 pm.

SHARP MZ80K, 48K, Basic, Forth + £100 software, £220 ono. Williams, Sheffield (0742) 588058.

VIDEO MASTER CHESS CHAMPION (6 levels of play), £25 Tel: 01-267 6201.

BIPAK SOUND UNIT for ZX81. £15 Tel: 0792 297638.

SHARP MZ80K 48K + programs, £320. Tel King's Lynn 673281

1 X SUPERBOARD II, 32 x 48 screen format with case, two joysticks, good condition. £60. Tel: (0206) 49212.

SHARP POCKET COMPUTER, P.C. 1500, also printer etc, urgently wanted. Ring after 8 pm 01-904 6078.

SHARP MZ 80K — 48K Ram, 15 months, Basic, toolkit, assembler, machine code, faulty reset switch, Space Invaders, Othello, + many other progs, £300. Tel: King's Lynn 674503 (eves)

TEXAS TI59 CALCULATOR + PC100C printer + 2 modules (maths. and stat.), £120 ono. Nash. Tel: Oxford (0865) 246149.

SOFTWARE for BBC B, 32K Snapper, Defender, Monster, Jumbo, Invader, Pirates, £10 2 Hardcastle Street, Belfast 7, NI.

VIDEO GENIE, unused system, 48K, double density twin 200K drives, dot matrix/printer, approx £200 worth books and software, cost £1,700, will accept £1,100 ono Tel. 0274 577636 (eves).

SWAP VIC20 for Spectrum. Tel: 01-459 5047 day, 01-459 2571 evenings.

SWOP VIC20 AVENGER Cartridge for Pirate Cove etc. Tel: Kirkcaldy 0592 261880

TRS 80 LEVEL II, 16K, with CTR 80A recorder, £80 of software, including Sound Generation, programs + supporting hardware, worth over £320, sell for £170 Tel: (045382) 2759.

TEXAS TI 59, programmable calculator, £60 Also P.C. — 100c Printer, £95, little used, Inst. Engineering module, £20, unused, supplied in original boxes. Tel: St Albans 32089 or Fairbourne 596.

VIC 16K Ram cartridge, £45. Tel: 0703 775680

ROWTRON TV game and 8 cassettes. £100 ono. Potters Bar 50498.

48K TRS 80 with lower case, Alan, joystick, stick stand, all leads, books and manual, good condition, £300. Tel: 05827 68663.

20in B/W TELEVISION (no sound), suitable for ZX81, £5 Tel: Stevenage (0438) 811634 after 6 pm (buyer collects)

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WANTED: Cassette unit for Vic20. Tel 0298 78421

WANTED: BBC Model B. Tel: Hull 649517

WANTED, VIC 20 cartridge Amegarace or Gort £15-£20 Tel Ampthill (0525) 402049 (5 pm).

COMMODORE PROGRAMS, ref guide Tel: Amit 01-868 0510.

YOUR COMPUTER, February edition, Vol 2 No 2 plus Vol 1 No 5 Will pay P&P Tel. Richard Sharod, Bracknell 29320

WANTED: Commodore machine language monitor cartridge in exchange for super expander cartridge. Tel Amit 01-868 0510.

WANTED: Sharp MZ80K or Vic20 plus 16K Ram and printer Tel: Wigan (0942) 36988

WANTED. Two disc drives for TRS80 Model I, Level II. Tel: Office hours 01-948 1704, evenings 01-948 1404.

WANTED. ZX Spectrum, 16K, £100 ono Sussex area Tel: Newhaven 5455

WANTED. COMMODORE VIC20 tape unit, must be in good condition Tel 01-890 3039 evenings.

WANTED. Cassette unit for Vic20. Tel 0298 78421.

WANTED; second hand TRS80 model, one, preferably with expansion interface + disc drives. Tel: W. Ellington 01-353 6723 days, or 01-794 3330 evenings.

PEEK & POKE

BRIDGED BY AN INTERFACE

Jill Edwards of Brookdene Avenue, Oxhey, Hertfordshire, writes:

Q I have just bought a BBC model B microcomputer, after using a Spectrum and ZX printer for some months. I would like to know if it is possible to use the BBC with the ZX printer. If so, where can I get the interface?

A The company that sells interfaces for use with the Sinclair printer is Microtanic Software. The address is, 235 Friern Road, Dulwich, London.

MAKING SENSE FROM NONSENSE

R E Martin of Clock Face Road, St Helens, Merseyside, writes:

Q I have had a 16K Spectrum for a few weeks now and I am very pleased with it. However, there is something that is causing me concern.

If I use a *Read* statement, *Read* (String Variable) and a *Read* (Numeric Variable) in the same program, the error message 'C' — Nonsense In Basic comes up when the program is *Run*.

Here is an example:

```
10 READ a
20 READ a$
30 PRINT a$ : PRINT a
40 DATA "bug"
50 DATA 10
```

It seems as though the *Data* statements have to be in the right order when using String and Numeric variables. This is not mentioned in the manual. Is this a bug?

A The first *Read* statement in a Spectrum will always *Read* the first *Data* statement that it comes to. The second *Read*, and second *Data* item and so on. This must always be kept in mind when using *Read*/*Data* commands.

In the example that you give the first *Read* variable is 'a'. This can only apply to a numeric variable. Your first *Data* statement is "bug". This can only be a value assigned to a string variable. So the reason that you get 'NONSENSE IN BASIC' is because you are trying to assign a numeric variable to a String name, and a String variable to a Numeric one.

Assuming that your *Read*/*Data* statements are in the right order then a line like *Print* A$; *Print* A is quite allowable.

CROSSING THE DIVIDE

N D E Alexander, of Rogerson West House, Merchiston Castle School, Colinton Road, Edinburgh, writes:

Q I am a Sixth Former studying Maths, Physics and Chemistry 'A'-levels. I am wondering about buying a programmable calculator/pocket computer (ie: portable). Please could you advise me as to whether this is a good idea and what sort of model you would recommend (not over £100). Are there any magazines dealing specifically with pocket calculators?

A You are approaching an area where calculators merge into computers. Even if you keep the price below £100, this still includes the ZX81 for £50 and the Oric for £99.95. However, neither of these is truly portable.

I suggest that you look at the Casio PB100 which costs £59.95. This has 544 programmable steps in 10 areas.

If you want to go up into the £100 area, then you have the Hewlett Packard 15c and 16c. The 15c is just below the £100 mark while the 16c is a little over. On the other hand, you might like to try and get a second hand TI59 or HP11c.

Unless you want a specialist calculator then I would suggest you look at the Casio PB100.

I do not know of any magazine specifically dedicated to programmable and portable calculators. But, Tempus deals in this field and might be able to help you. Tempus is based at 38 Burleigh Street, Cambridge CB1 1DG.

MISINTERPRETED BY TELEPHONE

M J Robinson of Barkham Ride, Wokingham, writes:

Q Is there any way that I could send a program down the phone from my Spectrum.

I have tried the direct way with the volume high and it does create some response on my brother's Spectrum at the other end.

A You need a modem. This stands for a Modulator/Demodulator and it converts the output of the computer into an audio signal. This is necessary because the telephone switching system cannot handle the normal DC output of the computer, as it interferes with the relay system at the exchange.

Without a modem there is liable to be a misinterpretation of the signal, which will return wrong numbers. In fact even with a modem, some telephone lines can be so bad that a program will corrupt. This should start to change over the next few years, if fibre-optic cable systems catch on. These should offer a much cleaner path for computer signals.

FROM OVER THE ATLANTIC

If Lunn of Allerton, Grange Way, Leeds, writes:

Q I own a TI99/4a computer. Could you please tell me whether I need to spend £66 on the extended Basic cartridge, to be able to program Space Invaders etc?

I would also like to know whether the magazine *99'er* can be bought in this country. I have asked in several major bookshops, but they have not heard of it.

A It is up to you whether or not you buy the extended Basic cartridge. It will supply many of the Boolean functions such as *If, Then, Else, Or Not*. It will also aid your control of sprites, and a disc system, which I would have thought would be very useful when writing games programs.

The magazine *99'er* can be bought direct from America, but it is also going to be available over here. As of February it will be available to members of TIhome.

TIhome is the TI users group in this country. It has its own magazine which is published six times a year and costs £12. You might find this a good place to look for further details about the whole TI99/4s system. For further information contact Paul Dicks, TIhome, 157 Bishopsford Road, Morden, Surrey.

FIGURING OUT FREE BYTES

Robert Smart of Griffin & George (educational distributors for the Spectrum), has written to me with a much easier way of working out the number of free bytes in a program. It works on both 16K and 48K Spectrums. It is *Print 65536 – Usr 7962*. If used before the program is Run, it will not take into account the area used by the variables.

Bill Longley of 388 Ipswich Road, Colchester, CO4 4EX, has written to say that he can offer a list of tips for the Spectrum to anyone who writes *and* encloses an SAE or 20p-worth of stamps.

To end, I would like to thank the person who sent me a copy of *Laserbug*, Issue 5, October 1982. This issue contains a review of the GP100 that I mentioned a few weeks ago. This issue also has a screen dump for the GP100, and advice on how to stop the stretching effect when the picture is transferred. *Laserbug* is at 10 Dawley Ride, Colnbrook, Slough, Berks, SL3 0QH. Back issues are still available and they cost £1.25 including postage.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Ziggurat

After Descartes

Discussion about artifical intelligence (AI) can be traced to an article by Alan Turing, *Computing Machinery and Intelligence*, in *Mind*, 1951)

Turing was trying to define what was intelligence *in practice*. He thought that if a hidden machine could fool us into believing it was human, then it was human. This was the "Turing Test".

AI attempts ■ copy human-like intelligence, hoping to make computers more useful, and also to understand the principles which make intelligence possible. A central feature of AI is the formulation of theories and models designed to show how the varying aspects of intelligence are possible.

As with any subject there ■ dissent about its exact nature. There are those who believe that a truly intelligent machine is possible, for example F H George in *Man, the Machine*, 1979. Many in AI tend to agree, though not many are as extreme as Frank George.

Some of the critics of AI take the position that there is something qualitatively different between man and machine, just as there is a qualitative difference between man and animal. J R Lucas *(Freedom of the Will*, 1970) points out that a computer is rule-bound and notes "we, being rational, . . . can get the hang of ideas without any rule being given us, just as we can recognise the truth of ■ proposition although it cannot be proven within the given [rules of logic]".

A recent development of AI, into Expert Systems (a partially intelligent system, with a source of information upon which the intelligence is exercised) is of great interest.

The system is called "expert" because it tries to emulate the workings of an expert in some area (drilling oil wells, monitoring patients, etc). Many expert systems were at work in the Falklands conflict, directing missiles and such like.

Expert systems were themselves under attack after the conflict, because of what were seen to be their shortcomings. It is thought that the HMS Sheffield was sunk because an expert system on board failed to respond to an attacking Exocet. The system on board had been told that Exocet was a friendly missile, because we also use Exocets. Reportly those trying to find out what actually went wrong couldn't understand how the expert system could be so stupid.

Recently, there have appeared several computer games which claim to use AI techniques — for instance versions of the game *Othello*, chess games, and the new adventure game based upon Tolkien's book *The Hobbit*. What do such claims actually mean? In games like Chess, the tactics (pins, forks, or skewers) can be well covered by computer programs: The difficulty comes in organising the tactics and the moves, the strategy which places one in a position where there is a tactical advantage.

Theoretically, a human player, who is able to appreciate strategy, should always beat a computer because a computer usually only tries to maximise short-term advantage — it will nearly always take a gambit pawn. The truth of the matter is, however, that computers win more than they should, because human players are not as good as they think they are.

At programs use what is termed "fuzzy" logic, choosing the most likely alternative (in statistics called the maximum likelihood solution).

AI programs using fuzzy logic follow Descartes' dictum: If in doubt choose the most likely option, and then believe you have made the correct decision. ■

Boris Allan

Puzzle

Up the pole

Puzzle No 43

The Third Lower Muddlecombe Scout Troop camp has two flagpoles, each fifty feet high, standing on level ground seventy-five feet apart. A single rope, 160 feet in length, has its ends attached to the top of both flagpoles, and has been pulled taut with a peg hammered into the ground — as shown in the illustration.

How far is the peg from the nearest flagpole — assuming the poles and peg lie in a straight line?

Solution to Puzzle No 39

No — chopping its head off and counting the rings is *not* the correct way to approach this problem! The following program gives a display of possible solutions:

```
10 FOR J=17 TO 400
20 GOSUB 100
30 NEXT J
100 FOR F=1 TO 399
110 IF (J-F)*(J-F) - (J*F+1) = 0 THEN PRINT J, F
120 IF F > = J THEN RETURN
130 NEXT F
140 RETURN
```

This gives pairs of values (J,F) of 21,8; 55,21; 114,55; and 377,144.

If it is assumed that a Giant South American Tortoise does not live to age 377 then the second highest solution ■ José is 55 years old and Felipe is 21 year old.

Winner of Puzzle No 39

The winner is: J. A. Brice, Wickham Road, Colchester, Essex, who receives £10. ■

Top 10

Atari

1	(1)	Air Strike	(English Software)
2	(—)	Miner 2049er	(Big Five)*
3	(5)	Preppie	(Adventure International)
4	(—)	Snooker and Billiards	(Thorn EMI)
5	(—)	Helical Ace	(Microprose)†
6	(4)	Star Raiders	(Atari)
7	(—)	Stratos	(Adventure International)
8	(—)	Threshold	(On Line Systems)†
9	(—)	Sunday Golf	(Adventure International)
10	(—)	Sea Dragon	(Adventure International)

*Cartridge. †48K disc.
Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Vic20

1	(6)	Frog	(Interceptor Micros)
2	(10)	Alien Attack	(Interceptor Micros)
3	(1)	Andes Attack	(Llamasoft)†
4	(9)	Abductor	(Llamasoft)
5	(—)	Traxx	(Llamasoft)†
6	(—)	Vic Rescue	(Interceptor Micros)
7	(2)	Gorf	(Commodore)*
8	(8)	Skramble	(Rabbit)
9	(—)	Penny Slot	(Interceptor Micros)
10	(5)	Grid Runner	(Llamasoft)

*Cartridge. †Requires 8K or 16K.
(Figures compiled by the Vic Centre, London 01-992 9904)

Spectrum

1	(2)	Penetrator	(Melbourne House)*
2	(1)	The Hobbit	(Melbourne House)*
3	(4)	Time Gate	(Quicksilva)*
4	(—)	Horace Goes Skiing	(Psion/Melbourne House)
5	(7)	Arcadia	(Imagine)
6	(9)	3D Tanx	(DK Tronics)
7	(—)	Spectrum Chess	(Arctic)*
8	(3)	Flight Simulation	(Psion)
9	(5)	Football Manager	(Addictive Games)*
10	(—)	Spectral Invaders	(Bug-Byte)

*Requires 48K.
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

ZX81*

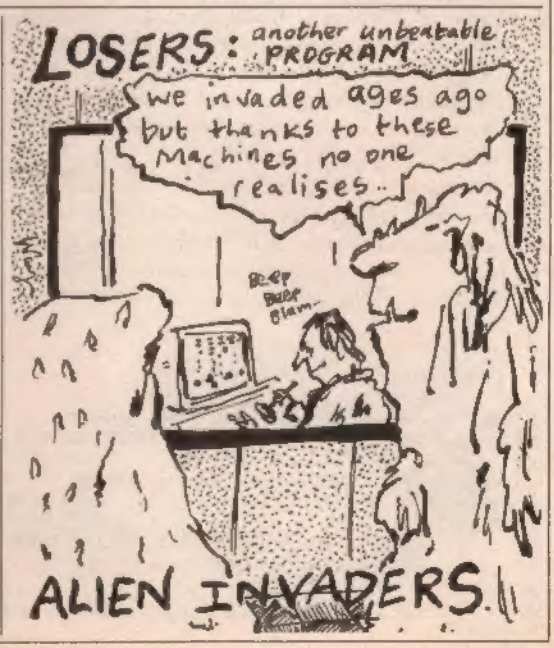
1	(2)	Flight Simulation	(Psion)
2	(3)	3D Defender	(JK Greye)
3	(—)	Frogger	(DJL Software)
4	(4)	Gulp II	(Campbell Systems)
5	(1)	King Kong	(Tony Barber)
6	(—)	Mazogs	(Bug-Byte)
7	(5)	Football Manager	(Addictive Games)
8	(10)	Sea War	(Panda)
9	(—)	The Fast One	(Campbell Systems)
10	(—)	Pimania	(Automata)

*All 16K.
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

Books

1	(2)	Spectrum Machine Language for the Absolute Beginner, *Tang*	(Melbourne House)
2	(3)	Creative Graphics on the BBC Micro, *Cownie*	(Acornsoft)
3	(—)	Compute!'s First Book of Vic, *various authors*	(Compute!)
4	(1)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)
5	(—)	Forty Best Machine-Code Routines for Your Spectrum, *Hardman*	(Hewson)
6	(5)	Programming the 6502, *Zaks*	(Sybex)
7	(6)	Understanding Your Spectrum, *Logan*	(Melbourne House)
8	(7)	Z80 Assembly Language Programming, *Leventhal*	(Osborne)
9	(—)	Mastering the Vic20, *Jones*	(Honiwood)
10	(9)	Graphs and Charts on the BBC Micro, *Harding*	(Acornsoft)

(Figures compiled ■ Watford Technical Books, Watford 0923 23324)
(Last week's position in brackets)



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